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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:
ELECTRO-PLATERS REVIEW

A MONTHLY JOURNAL RELATING TO THE METAL AND PLATING TRADES

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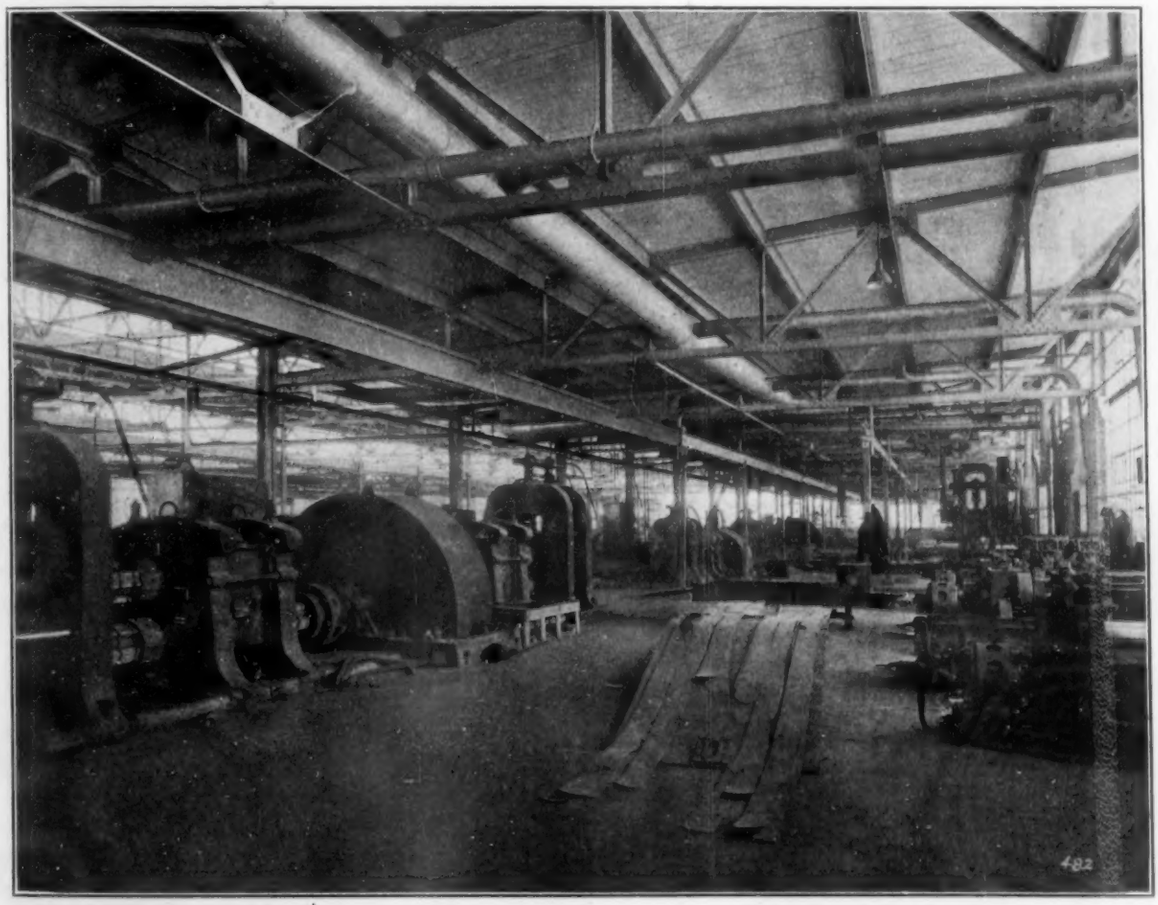
Vol. 16 NEW YORK, JANUARY, 1918 No. 1

A NEW BRASS MILL IN THE MIDDLE WEST

A Brief Description of the New Plant of the Cleveland Brass and Copper Mills, Inc., at Cleveland, Ohio.

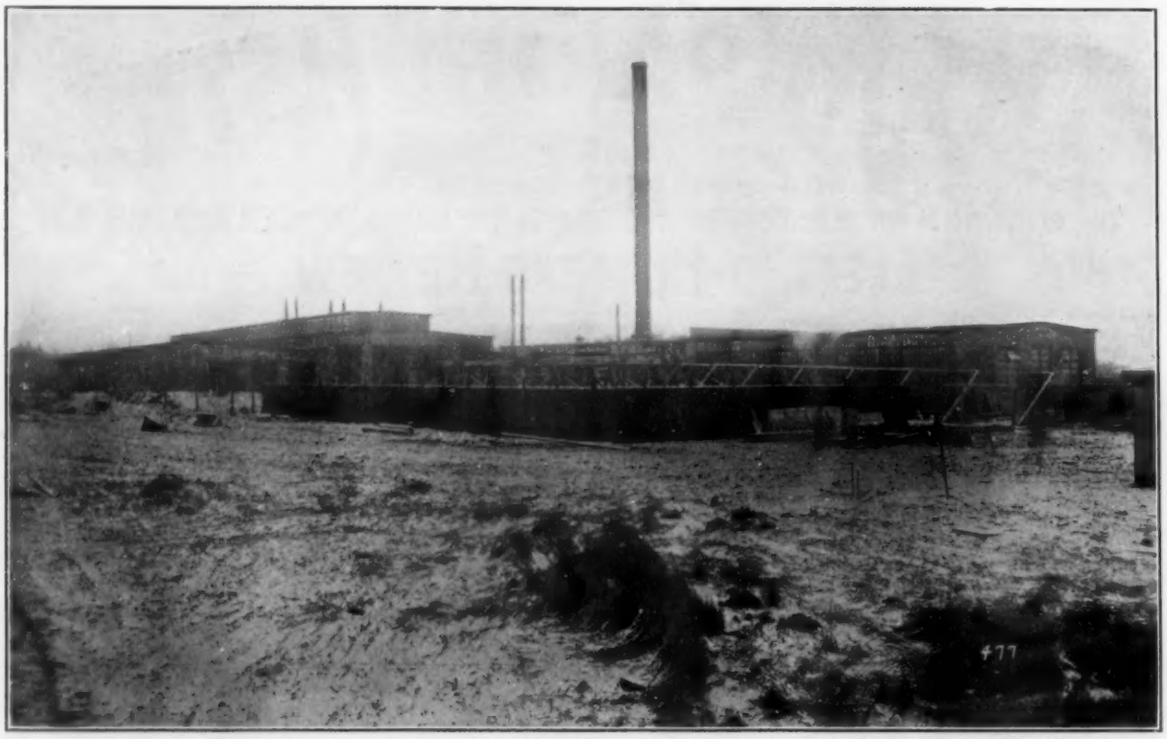
Written for The Metal Industry by L. J. Krom.

In spite of the fact that Cleveland, Ohio, the Sixth City of the United States, has for some time been in a position to offer exceptional advantages for the establishment of a brass and copper rolling mill, none of the propositions put forward from time to time succeeded until recently. The plant of the Cleveland Brass and Copper Mills, Inc., which is described by text and pictures in this article is now in operation after several years of hard work of promotion and organization. The Metal Industry in April, 1917, published a notice to the effect that a contract for a brass mill had been awarded to Westinghouse Church Kerr and Company of New York. In May, 1917, was published a sketch of a proposed layout and since that time operations have been rapidly pushed until now we find the mill and casting shop going in full force to supply the wants of the many industries located in Cleveland and elsewhere.

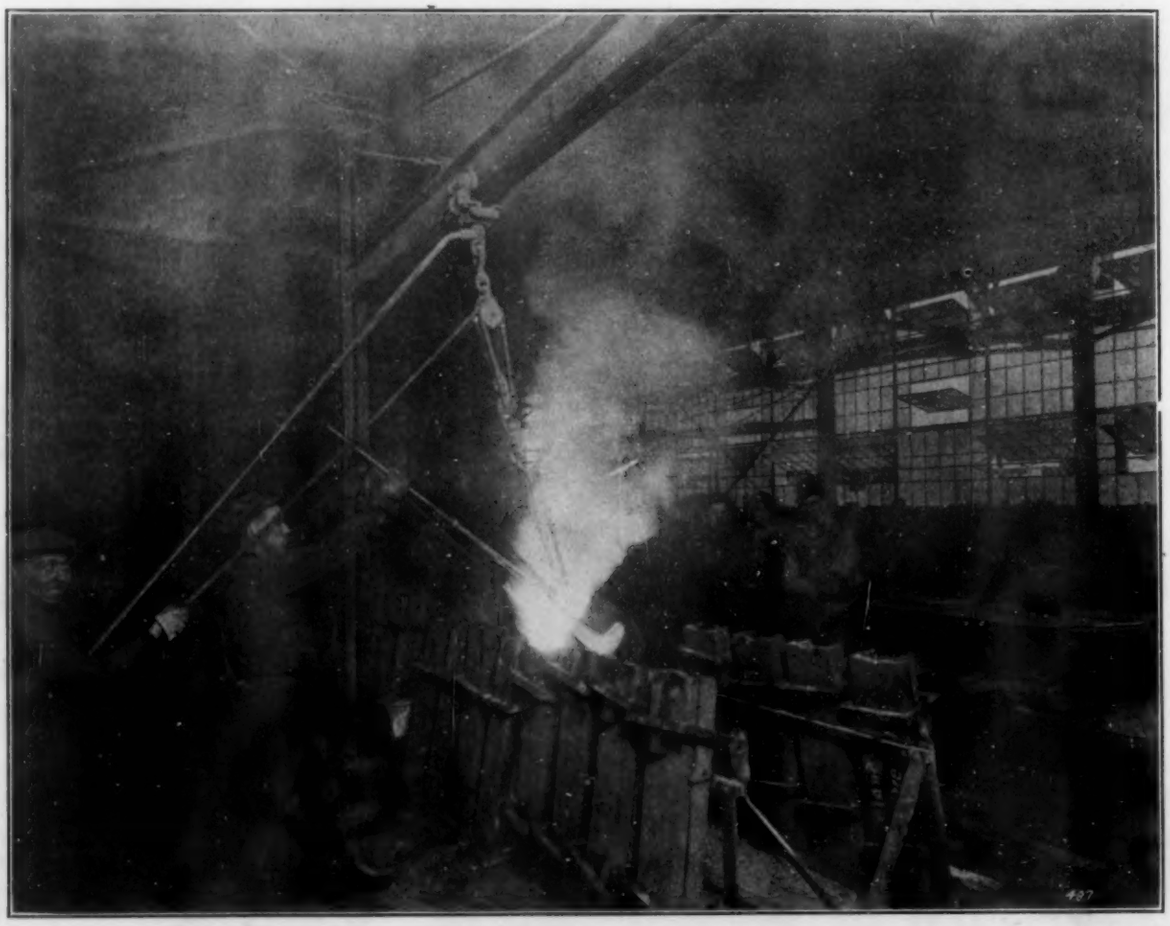


A VIEW OF THE ROLLING MILL, CLEVELAND BRASS AND COPPER MILLS, INC., CLEVELAND, OHIO.

It has always been admitted by those qualified to judge that Cleveland was a strategical center for a brass and copper mill. Many a New England metal man has turned his eyes with longing towards the natural resources possessed by Cleveland not to be found in the



A VIEW OF THE PLANT OF THE CLEVELAND BRASS AND COPPER MILLS, INC., CLEVELAND, OHIO.



CASTING METAL IN THE CASTING SHOP.

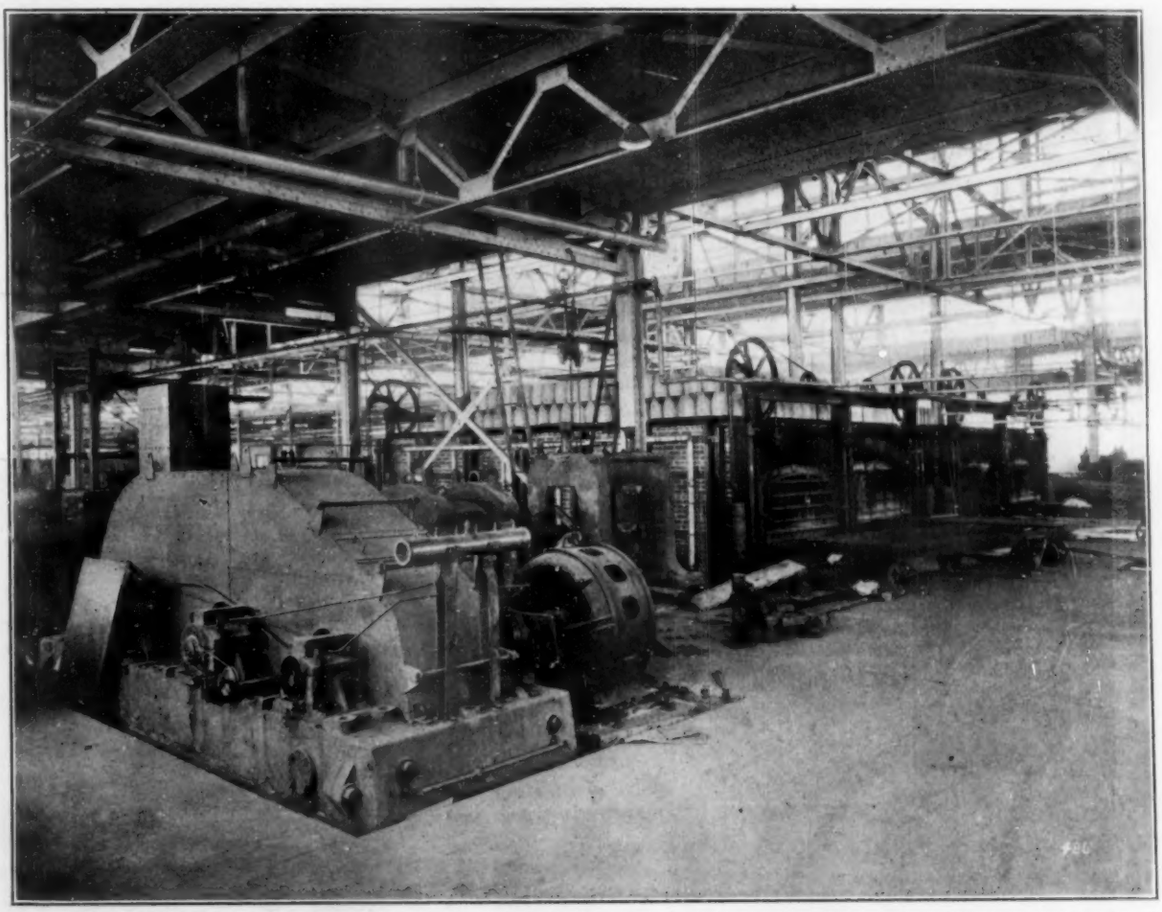
region of the rock ribbed backbone of the Naugatuck River. But for one cause or another the projected plants fell down and some enthusiastic promotor would be left with his empty pockets and much handled blue-prints to ruminate on the short sightedness of mankind!

CLEVELAND AS AN INDUSTRIAL CITY

As told in THE METAL INDUSTRY in September, 1916, Cleveland from an industrial point of view is one of the most wonderful cities in this country. Her industrial development has occurred almost within the last decade. Founded in 1796 by Moses Cleveland it became a village in 1836 with 150 inhabitants. As a city it started with only 5,000 people, while today it is the sixth in population second in value of products and in 1916 led in the amount of war orders placed in the United States.

Located on Lake Erie, six hundred miles from New York and three hundred miles from Chicago, the city of Cleveland, if the present rate of development continues, seems destined to become the third city in importance in no great length of time. Opportunity for employment has been a factor in bringing the present population up to 700,000. This opportunity has been made possible by the availability of good factory sites at reasonable cost. This, in addition to location as regards markets, and sources of supplies, good transportation facilities, good living conditions for workers, low cost of fuel, power and water, reasonable taxes, has all contributed to placing Cleveland near the top of the industrial ladder.

In sharp contrast to the conditions as to transportation in the eastern brass centers, Cleveland is remarkably well equipped. The Cleveland Short Line Railway, a belt line just completed at a cost of $18,000,000, makes a circuit of nineteen miles around the city and intersects every railroad entering Cleveland. This is claimed by authorities to be the most convenient belt line of any American City. By boat lines Cleveland has practically express service at lower rates than rail freight rates to the principal parts of the Great Lakes eight months in the year. The railroad facilities are abundant, including practically all of the branches of the New York Central Lines, the Pennsylvania lines, the Erie, Nickel Plate and Wheeling and Lake Erie, connecting with the Wabash system to the southwest and the Baltimore & Ohio. Another factor that has been a great aid to the metal industries of Cleveland is the use of natural gas for fuel. This is piped from West Virginia and sold during the summer months for power at 13 cents per thousand cubic feet, while its winter price is 30 cents. Water is equally cheap, for there is the whole of Lake Erie to draw upon! About 5 1-3 cents per thousand gallons is the charge for manufacturing purposes, which is claimed to be lower than anywhere else in this country with two exceptions.



ANOTHER VIEW OF THE ROLLING MILL. SHOWING THE TWIN DOUBLE CHAMBER ANNEALING FURNACES.

This, then, is the city that the projectors of the plant, shown in the accompanying photographs, have selected to locate in. I believe that anyone studying the situation in the metal business today will agree that they have chosen wisely and well. After the great world war is over and the metal business has gone back to as nearly normal conditions as it ever will, I believe the Cleveland Brass and Copper Mills, Inc., will find themselves in a

B. M. GARDNER,
Secretary and Sales Manager.

H. C. OSBORN,
President.

B. F. BRUSSTAR,
Vice-President and General Manager.

good geographical position to hold their own.

THE CLEVELAND MILL

The new mill as shown in the pictures consists of the following: A main mill building, 225 feet wide by 436 feet long, of the most modern construction. The machinery in the main mill includes two sets each of 22 x 24 inch, 20 x 24 inch, 18 x 20 inch, and four sets of 14 x 16 inch rolls. Each set of rolls has its own motor for driving. There are also in the rolling mill: three overhauling machines, two slab milling machines, two nine-roll

A VIEW OF THE ROD AND WIRE MILL OF THE CLEVELAND BRASS AND COPPER MILLS, INC., CLEVELAND, OHIO.

flatteners, three slitting machines, three drying-out machines, eight W. S. Rockwell under-fired muffles or annealing furnaces, one six-inch squaring shears and one plate saw. There are also the necessary pickling and rinsing tanks and other labor-saving devices, as will be seen in the photographs.

The rod mill, which occupies a portion of the rolling mill building, contains one pair of 18 x 36-inch rod rolls, one 50,000-pound draw-bench, 25 feet long; one 25,000-pound draw-bench, 40 feet long; one 75-foot draw-bench, four heavy full blocks, four heavy bull blocks for lighter rods, seven pointing machines, one Medart straigtener, one Shuster straightener and two tumbling barrels. All the pickle tubs are operated automatically and all the machinery is driven by separate motors.

The casting shop adjoins the main rolling mill and contains at present eighty pit fires for melting metal in crucibles. Provision has been made for eighty more, but at present this space is being used as a metal storage house and a chemical laboratory. There are in the casting shop two heavy alligator shears for cutting gates off cast bars. There is also a store house 36 x 75 feet, and a 500-horsepower boiler plant for heating the mill by a sanitary pre-heated system. The machinery was made by the A. Garrison Foundry Company, Pittsburgh, Pa.; Torrington Manufacturing Company, Torrington, Conn., Waterbury Farrel Foundry & Machine Company, Waterbury, Conn.; Continuous Casting Company, Garwood, N. J.; Philadelphia Roll & Machinery Company, Philadelphia, Pa.; Allis Chalmers Company, Chicago, Ill.; Lincoln Motor Company, Morgan Construction Company, Worcester, Mass.; Waterbury Machine & Tool Company, Waterbury, Conn., and Sessions Foundry Company, Bristol, Conn.

The plant is now in complete operation and is capable of turning out under present conditions three million pounds of metal per month of commercial and not war business.

The personnel of the company is made up as follows: Henry C. Osborn, president American Multigraph Company, president; B. F. Brusstar, formerly general manager of the Michigan Copper & Brass Company, Detroit, Mich., vice-president and general manager; B. M. Gardner, secretary and sales manager, and H. P. McIntosh, Jr., treasurer. The directors of the company are: B. F. Brusstar, J. H. Foster, B. M. Gardner, C. R. Hamilton, J. H. Harrison, J. A. House, H. P. McIntosh, Jr., S. H. Moore, H. C. Osborn, W. D. Sayle.

HOT BRIGHT COPPER BARREL PLATING

A Practical Article on a Difficult Operation.

Written for The Metal Industry by Royal F. Clark, Foreman Electroplater, Acme Shear Co., Bridgeport, Conn.

To deposit copper from an alkaline electrolyte in a lustrous condition, an addition agent must be used. The most efficient "brightener" to add to a copper cyanide (CuCN) electrolyte is carbonate of lead ($PbCO_3$) dissolved in a strong solution of caustic soda (NaOH).

The writer described the deposition of bright copper (Cu) from still baths in the March issue (1908) of The Metal Industry on page 90:

A copper cyanide (CuCN) solution for barrel plating must be of a higher density than that of one used for still plating. A still bath should register 10° to 12° Baume, while a barrel plating solution should show a reading of from 20° to 25° Baume at room temperature. Of course when the electrolyte is heated to a higher degree Centigrade or Fahrenheit, the Baume reading will be lower.

As there is a larger metallic copper (Cu) content in a barrel solution than in a still bath, consequently a larger amount of the "brightener" must be used. It is essential to keep the copper (Cu) and lead (Pb) in a state of equilibrium.

The free cyanogen (CN), copper (Cu) and lead (Pb) content, also free caustic soda (NaOH) must not be allowed to fall too low for good results. The solution should be heated with an iron steam coil, and should be kept at a uniform temperature of between 38 ° to 43° Centigrade. By making a new solution with copper (Cu) metal cyanide and adding known quantities of the lead (Pb) brightener until the deposit has become bright upon all portions of the cathode, the plater can to a certain extent standardize his solution.

When the solution is in good working order, and at rest, the lead (Pb) will adhere to the copper (Cu) anodes, which, upon the passage of the electric current, will immediately disappear and go into solution.

This adherence of the lead (Pb) upon the copper (Cu) anodes will be found to be much more rapid when the electrolyte is hot than when it is cold.

If the solution is kept up to its highest pitch for brightness, articles can be dried carefully and buffing of the copper deposit can be dispensed with.

The writer recalls an instance where he was bright copper plating zinc oil cans in a hot solution. After coming to the plating department with a very high luster upon them, they were electro cleaned and copper plated from 30 to 40 minutes in a plating barrel. Upon taking them out the copper deposit had the appearance of buffed copper. Oil cans made of steel and tin were also plated in the bright copper solution with excellent results.

For articles which permit the use of plating barrels, the bright copper solution is unsurpassed, as it obviates the necessity of brightening or burnishing the artcles with steel balls or dry tumbling.

By making very small additions of the lead (Pb) brightener to the copper (Cu) electrolyte at certain intervals the copper (Cu) deposits will continue to be deposited in a bright uniform state.

An incident is cited to emphasize the above. An ordinary copper cyanide (CuCn) barrel solution was turned into a "bright" one, whereupon the cathode connections, which were on the interior of the plating barrel, one at each end, began to take on a bright appearance. This continued from day to day until at the end of three months the two cathode plates had the appearance of being polished and buffed. It might be mentioned that the plates were in an exceedingly rough state, similar to an electrolytic copper (Cu) cathode.

The writer has a sample of bright copper deposit upon a novelty clock case made of cast antimonial-lead which has deep recesses or background. It was neither polished before plating or buffed afterward, and was electroplated for five hours continuously, was lacquered by dipping, and after seven years standing is still in a highly lustrous condition.

REVIEW OF THE PLATING INDUSTRY FOR 1917

By Charles H. Proctor, Plating Editor of The Metal Industry and Founder of the American Electro-Platers' Society.

In reviewing the plating industry of the year 1917, the entry of the United States into the world war has had many important bearings upon the industry and has increased the demand for plated products to very large proportions. If we were all familiar with the thousand and one articles made from metal that are used by the Army and Navy departments from the tremendous coast defense guns to the common pin, we could then realize the large increase in metal products that are required for our expeditionary forces of the sea, land and air to accomplish the work that has been laid out for them to do ere this government has accomplished its purpose to make the world free for Democracy.

The military departments of the United States need hundreds if not thousands of manufacturing plants to fill the requirements for equipment necessary to bring every man to that efficient standard that has been reached by the enemy. It is absolutely necessary then that every man in every line of production do his utmost to speed up production to the point of a hundred per cent. efficiency. Let us all do our bit, and then when we have gone "over the top," down on the other side, we will have a lasting peace. I am sure every man in the plating industry is doing his share of the work of this world's war.

During the past year I have traveled many thousands of miles, visited hundreds of plants and have been surprised at the very great increase in plating plants and the endless variety of goods being plated for the government. These finishes cover nickel, copper, army bronze (a description of which appeared in The Metal Industry in November, 1917), zinc and silver. Many of the articles are made from solid brass or bronze and finished in the dark navy or the military bronze finish, or nickel or silver plated. Firms manufacturing plumbers' supplies and silver-plated products are kept extremely busy manufacturing materials for the new standardized ships, which will be turned out by the thousands before long. Even the requirements of these ships are too numerous to mention, and only when the specifications covering the needs of the various arms of the government have been gone over in detail is it possible to realize what the thousand and one things necessary consist of.

The specifications covering the plating of steel parts for aeroplanes are a surprise to the writer, and I feel sure that practically no protection from corrosion due to atmospheric conditions can result from the deposition of copper and nickel, totaling .0008 of an inch as the minimum and not exceeding .001 of an inch as the maximum. Copper and nickel do not give a rust free coating unless the deposits are unusually heavy and free from a porous deposit, which is usually due to the occlusion of hydrogen. In my opinion, zinc should be used exclusively for steel products that are to be finished for non-corrosive protection against weather conditions and such a deposit should be obtained from the alkaline zinc solution, as this type produces an adherent coating, uniform in texture and non-crystalline. Owing to the freedom of the deposit from hydrogen and the high conductivity of the solution it gives a uniform deposit over uneven surfaces. Such a deposit should not be below .001 of an inch, and after plating in the zinc solution the articles should be washed thoroughly in cold and boiling water and then immersed in a solution of equal parts of paraffin oil and paraffin wax heated to a temperature of 212 degrees Fahr. The articles should be immersed in such a solution for not less than a minute. This immersion will fill the pores of the deposit, if there are any, and also coat the zinc-plated surface with a film of paraffin wax which, in itself, has proven to be impervious to moisture. The writer recently developed an improved solution of the alkaline type for plating steel products with zinc, and this formula with data covering the manipulation of the solution is at the service of the Government or to anyone interested in an improved deposit of zinc, free from the usual imperfections of electro deposits of zinc.

We have recently heard comments and criticism of men employed in the various departments of the Government due to the inefficiency and lack of practical knowledge of the various manufactured products that come under their supervision. I am going to try and make a plea for more efficient co-operation from this standpoint, thus eliminating politics and theory. I do not know of any well-known practical man who is in the employ of the Government for the supervision of plated products, but there are such men if the Government will only ask for them.

The writer had the pleasure of meeting a captain from the Quartermaster's Department at the recent convention of the American Electro-Platers' Society at St. Louis, Mo. The captain addressed the society at this convention on "Co-operation," and explained how he had been able to save $125,000 in his department by substituting zinc-plated steel parts for brass, which are used in the manufacture of portable tent equipment for the army. Having had a practical business training in manufactured products he realized what was possible to accomplish and set out to prove that he was correct, thereby saving $125,000 for the Government on one contract. The captain spoke of the valuable assistance given him by members of the American Electro-Platers' Society by enabling him to prove his ideas regarding zinc-plated steel articles.

Let us hope that there are hundreds of such men working for the United States Government and the peoples' interest, if not there should be such men who can judge things from the practical standpoint rather than by theory. The practical man is willing to give his services to his country and the best there is in him for the cause.

Another important bearing upon the future of the plating industry was inaugurated in an address by Dr. Blum, of the Bureau of Standards, at the same convention of the American Electro-Platers' Society, which was that he suggested that the society should co-operate with the Bureau of Standards in standardizing plating solutions and working out the problems the plater has to contend with. This could be accomplished by financial assistance from the society for supporting a man at the Bureau of Standards to carry on this particular branch of work, as every available equipment will be found in the laboratories of the Bureau which could be used without any compensation from the society. This suggestion of Dr. Blum's was favorably acted upon and the society is making

an effort to raise the sum of $2,000 per year to support such a man for the work outlined. It seems to the writer that every manufacturer maintaining a plating department should be vitally interested in this important step. Remember, after the war it may be a war of commercialism in manufactured products. It is then absolutely necessary for you, Mr. Manufacturer, to do your bit now in helping the American Electro-Platers' Society, through its members, to make your plating departments as efficient in production as any other industry.

The American Electro-Platers' Society is rapidly going forward and its members are now acquiring knowledge of the chemistry of electro-plating, and this knowledge, combined with the practical knowledge he meets with in every day practice, makes him a more valuable employee. Many of the branches of the society already maintain experimental laboratories for the benefit of their members, and they are proving to be important factors in the future development of the knowledge of its members. I have also observed in my travels that many platers have installed small experimental laboratories in connection with their plating departments. This augurs well for the future, as there is no doubt that within a few years the old rule of thumb methods will have passed away and the industry will be placed upon a more scientific basis. By having experimental laboratories the planter will then know from a logical standpoint what was the true cause of his numerous difficulties encountered in the past.

However, one important fact that must be borne in mind in connection with the proposed co-operation with the Bureau of Standards in standardizing and research work in plating solutions is that the man for the position must not be a theorist. The plater of today and of the future must obtain practical economic results, so whoever the incumbent might be, he must be a man with a thorough knowledge of the industry in the broadest sense, both from the chemical and practical standpoint.

Taking the plating industry as a whole then, it may be said that it has made important progress during the past year, both chemically and mechanically. For instance, a number of patents have been issued that have enabled the plater to produce a greater output; the metal cyanides have practically eliminated the use of carbonates in plating solutions, etc. The economy in the use of the metal cyanides has been in the saving of cyanide, which has proven to be an important factor owing to the cyanide conditions during the past year, and the same conditions will practically exist during the year 1918, owing to the uncertainty of raw materials. However, it seems that the price of 37 cents per pound for sodium cyanide (96-98%) will be maintained.

There have been some new substitutes produced during 1917, notably Polysulphide, which replaced the use of liver of sulphur or sulphuret of potassium, which cannot be obtained now. Another substitute is Platin-Nig to replace platinum chloride. The use of Platin-Nig will enable a great saving, as this material is very much cheaper than platinum chloride. Sulphocyanide of sodium is still another substitute and is used to replace the potassium or ammonium salts in black nickel plating.

The condition of the silver market has been a disturbing factor during the year 1917 in the manufacture of sterling silver goods, but it is to be hoped that during 1918 some basis for a satisfactory price for silver will be reached by the Government and its Allies to prevent undue fluctuation. No doubt the time has come when silver should be maintained at a standard price, similar to that of gold, so that articles manufactured of silver will have a standard value. The demand has been unusually good during the past year for silver articles and manufacturers report a very busy year. The Colonial style has predominated in flatware and the English and Dutch styles have been reproduced in holloware. The finishes have been mainly in the Sheffield and antique effects with gold linings.

Articles of jewelry have been made in endless variety but mostly of the military style though, however, the various finishes which prevailed during 1916 are still in vogue and they are bright gold, old English, rose, green and platinum finishes. Platinum on account of its intrinsic value is still in great demand, but white gold is increasing in popularity owing to its smilar appearance to platinum. It is advisable then that the consumer be careful in making such purchases as the unscrupulous dealer will, in many instances, sell a white gold for platinum. It might be well to mention here that the atomic weight of gold and platinum are very nearly the same, while the atomic weight of white gold containing silver is less than platinum; so an identical article made from white gold would weigh much less than platinum. The atomic weight of fine gold is 197.20, platinum 194.30, and silver 107.66.

In the manufacture of lighting fixtures there has been a conglomeration of many periods and the finishes have been numerous. About every type of bronze that has ever been produced and many types that were never before produced have been applied as trade names to products of this type. The verde greens, however, are still in good demand and also the polychrome finish; the numerous colors and shades of which have been produced by the pigment method rather than the chemical. The manufacturers of lighting fixtures as a whole report excellent business conditions during the past year.

Labor conditions, however, are in serious straits and it is apparent that the women will have to take up the work of the men in order to keep up production. The production of automobiles will be curtailed from fifty to sixty per cent, but the plants that are engaged in this important industry will be used to their full capacity in the production of military and naval equipment for the government.

The above is just a brief summary of the plating industry for 1917 and let us all hope that in the review for 1918 that we will be able to record the end of the great war and that we will then have a lasting peace.

GOLD COLOR ON BRASS

For coloring low brass with fine gold by the salt water process, the following formula gives a rich yellow color:

Water	1 gal.
Yellow prussiate of sodium	8 ozs.
Phosphate of sodium	8 ozs.
Carbonate of sodium	8 ozs.
Gold (as fulminate)	4 dwts.

The gold should be converted into fulminate, then boiled with the yellow prussiate of sodium until the iron coagulates and the solution turns dark red. As soon as the solution turns red, the phosphate and carbonate of soda should be added and the solution allowed to stand for two or three hours. Filter and use the same as solutions made with yellow prussiate of potash. Yellow prussiate of sodium is about one-tenth the price of prussiate of potash, and gives identically the same results.—O. A. H.

THE HARVEST OF THE BATTLEFIELDS

How the Boundless Fortunes in Old Metal of Every Sort Will Be Garnered From the War Zone Once Peace Is Declared

Written for The Metal Industry by Felix J. Koch.

Not all the treasure of Captain Kidd, nor all the loot of the Spanish Main, nor all the gold and diamonds and precious stones otherwise which the fabled Cities of Cibola were reputed to contain for him who'd come and take, combined, would make a circumstance to it.

Hundreds, thousands, aye millions of dollars' worth of metal—metal of every imaginable sort and, again, of sorts which carefully guarded secrets of manufacture will, until this harvest-tide and chance, then of analysis, prevent even the most skillful metallurgist

AWAITING BATTLE. ODDS AND ENDS ARE DROPPED.

from imagining are lying, free to the taking, in No-Man's Land—here, there, the otherwhere, in the long war-zone and in the path of retreating and advancing armies—the offal of battle, to be picked up and kept really by who-soever might choose! Never in all world-history has Europe presented such a paradox.

On the one hand, we read of the Terrible Hun ordering every man, woman and child who has anything out of certain metals anywhere in the shop or home, to produce it, that it may go into war munition! On the other, here, within a dozen feet, sometimes of the front-line trenches lie fortunes, sinking slowly into the morass or covering themselves with the earth blown round by this, that and the other big shell as it falls.

Starving in the very midst of plenty, Tantalus himself saw no such starvation amidst superlatives of riches as here!

Obviously the metal industry of the world has not looked on at this prodigal waste without considering! Some time this great war must come to end and then, well, then, it is a simple thing of course for a skilled metallurgist to reduce back to molten mass such things as cannon and fragments of shell-case, the steel plates of the mighty armored automobile, the broken-in sides of the "tank." Out the melee of the field, too, will come infinity of other metal treasures.

Europe, already now, is feeling the bitter pinch of poverty born of the war. Through all the districts where actual conflict has been waged homes have come down; fields been torn up; the crops that might be started have been destroyed; the cattle, the other animals of the farm, been destroyed in like turn. When peace comes, eager as these peasants will be to rebuild, to restore things, there must come a long, tedious waiting time. Governments, no doubt, will issue plows, seed, perhaps supply infinity of other things for the farms. But that will take time; what is more, once those fields are to be put into cultivation anew they must, first of all be cleared of the *debris* of war.

Here, then, the initial step in the gleaning of the fortunes from the battlefields. Peasants, eager to make their lands ship-shape once more for the crop, will glean of themselves. Eager, again, to get the land cleared quickly as possible, they will welcome this cheap peasant labor, to be cheaper still, once half the work is gone and reconstruction not yet fully on with governmental aid. What is more, the more there is garnered by way of the "junk" of war, the more the land-owner will get for it, and the sooner he will realize on the trove.

Hence, those who have in mind this systematic garnering of the loot of war from the battlefields are considering definite plans. One is direct purchase from the stated government within whose territory this plunder will then lie, of all of it within stated space, along with right to get and haul. This is in the event that such government will claim all war material to be part of its spoils of the war.

Secondly, assuming, as is likely, that governments shall allow each land-owner all things of such sort left on his estate, as a simple form of helping finance him toward putting his desolate farm to rights, the man to sell the loot and use the money, then systematic

OFF TO GATHER UP METALS.

agreement to pay each such land-owner for either everything found on the place at so much for the lot, or pay him for exclusive right to glean and then at so much per ton, or wagon-load, or other pro rata scale.

The third method, and it is probable that this and some variant of the first combined, will be the eventual procedure, will be to open headquarters at convenient points on the battlefields, advertising that any one having metal off the fields of any kind, sort or description, from a handful of bullets to a monster cannon, de-

stroyed by some happy shell in such wise that there is nothing for it but to smelt anew, should bring it here and be paid at so much per pound or ton for stated sorts of the spoil.

In all events, even where the governments reserve to themselves the metals found, peasantry will undoubtedly be employed along, perhaps, with soldiers still in service here to seek for it and garner.

After all, though, when it comes to resurrecting the larger things, services of professional wreckers will undoubtedly be brought in since these can get results with metal junk so strewn in a tithe the time the uninitiated would so do.

AFTER THE RAIN OF SHELLS.

Probably as finished, an expert in this work of wrecking, or, as it's usually called, "junking" big metal of all sorts, as any man in the States (and it is believed that American metal concerns will take a hand in trying to secure some of this war-zone metal; sending American experts like him over to direct the work in turn) is L. F. Culver, associated with a giant Cincinnati wrecking concern whose operations extend over the entire Middle West.

Discussing this matter of gleaning on the battlefield, Mr. Culver gives some interesting data indeed:

"Primarily," he suggests, "in addition to the very obvious use of human labor in picking up and bringing to stated piles whatever may be, the block-and-tackle is the stand-by in our work.

"With such, in the hands of expert wreckers, a big cannon weighing two or even three tons becomes no problem at all. The block-and-tackle is simple hooked to it and up she goes into the air and dropped where-so-e'er. For this work, however, we employ a three- or four-shift pulley. Things have come to fine point with this, and it doesn't take a corps of men over fifteen or at most twenty minutes to set this up. For that work we use normally riggers who have been sailors, and this since sailors, above all other crafts, have the knack of keeping out of each other's way.

"Through the groove of the pulley at the top of the device goes the foundation of the actual work, the rope, and while one might imagine us to use a steel cable here instead, good manilla rope, say of an inch and a half or two inch size, is preferred.

"The monster of metal drawn out of the hole into which sunk, or raised to the point where transportation of it can begin, a huge tractor would be at hand to attend this. Incidentally, while block-and-tackle went up, while work of raising was on, the assistants would be laying a corduroy road for the hauling the cannon, let's say, over. With these roads, in this work, men are arranged in endless chain, each man carrying the plankage from the trucks of supply, laying, then coming back for more. Where but one heavy piece of wreckage lies in a section, often an entire road is not laid to the base but, instead, a portion is laid, the tractor run out on this, then the men bring the planks from its start to in front of the machine, and so make a path for it as it goes on and later returns. The caterpillar type of tractor is, of course, the one to be preferred in such place.

"But, wheresoever possible, the skilled wrecker does not bring in his spoils as they lie in the piece, except where they may be repaired and made ship-shape at a cost far less than what they would bring if sold for 'junk' per se. Pieces, big and small, are 'junked' or broken up right in the field wheresoever possible, the wrecker having more room to work there and it saving carriage all along the lines to the actual smelting place in turn. To make every mass of metal occupy smallest possible amount of space is the axiom of good wreckerdom.

"Many and varied the methods a battlefield might employ then, but in last analysis you'll find that good strong men working in pairs or sets of fours and armed with strong sledge hammers, the ten to twelve pound sorts can do the very greatest part of this work. Some time ago at a huge lead plant in the Mid-West we were called to dispose of a lot of old machinery, iron and cast steel primarily, and the men with the sledges accomplished the work throughout.

"Where these workers won't do, compressed air or acetylene burners are made use of here. With the air

CHILDREN ARE ALLOWED TO RUMMAGE.

under pressure, thus, we tackle the very largest boilers, cutting them through with ease. Taking the torch, we make a ring about the boiler, crack it open, and it splits apart with the ease almost of some monster egg shell. Similar methods would be used for great heavy slabs on the battlefields, in fact with about everything desired from armor plate down.

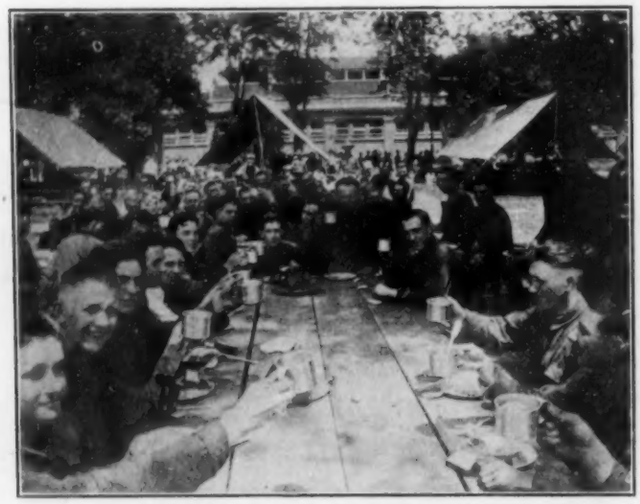
"Briefly, by whatsoever method, the attempt is always to reduce things to pieces which can be handled by a man. Such unit will vary at from thirty-five to say forty pounds. Where an object is round, like some bomb shell, and not easily seized or carried, the men will roll or push it to a skid and then take it out on

this over runners, much in the very familiar fashion used by farmers with matter brought from the fields.

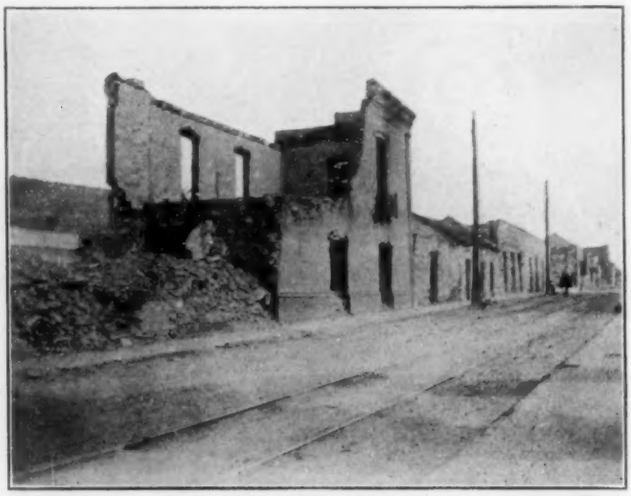
"Smaller objects are carried as best may be; sometimes little trucks are furnished the men for the purpose.

"In the garnering, while primarily one is after metal, the good wrecker takes and saves every trifle down to tiniest, for which he can in any wise find sale.

"Wrecking, in fact, has been reduced to a science, and that these spoils may not be damaged by say, rain or snow or wind, we keep a wrecking crew prepared for duty at all hours of day or night.



MILLIONS OF METAL CUPS ARE LOST.



A FINE CHANCE TO PILLAGE.

"Crews, however, let me re-emphasize, must not be overlarge, always that they do not get into one another's way. Assuming a stated battlefield with its trenches to be of four acres area or a given wrecking concern to be assigned the 'cleaning' of such a patch, and a hundred men at very most would suffice with the methods used by us." (Concern is Western Wrecking Co., Cincinnati), "today."

From the wrecker's pile to railway or ship and then to smelting point and so on, the story is an obvious one.

Europe has become so demoralized industrially, however of late, that chances are the ships sending over to her the infinity of supplies she will need, come the peace, can carry this junk metal to American or British concerns, if but as ballast, and at profit at that.

Much of the material would very likely find welcome here with concerns at Bridgeport, Conn. (Am. Brass Co.), and again at Rome, N. Y. (Rome Copper and Brass Co.), we are told by those handling junk of such sort where at all within the lines their names suggest, to wit, of copper and brass.

For iron and like material two great Cincinnati concerns are afield (Joseph Joseph Company—Hilb & Baur) and the one of these (H. & B.) give interesting vignettes of this prospective battlefield trade.

"We buy and in turn sell scrap metals of all sorts," their management tells us, "and when the war is over it will no doubt pay many a concern in such line to go over and get a share in the junk. Everything along such lines, substantially, is taken with an eye to melting over. We buy it, that's to say, and then sell to the smelters and that according to the market price. For brass this is 19c., for copper 20c. the pound over there. The government has set a price on copper of twenty-three cents; three cents a pound would cover the expense of shipment nicely. We have known it to be shipped at as low as a cent and a third the pound at profit, so that with copper at twenty cents on the field or at port, it would pay to go get it for use here.

"Local accumulators on the fields would soon find a standard price no doubt among the jobbers to whom they brought it; these, in turn, would soon find a standard price to their markets, such firms as ours. Probably the one thing our markets in turn would insist on is that the material come in sizes, forms that they could handle, and this might imply anything from dynamiting to sunder, to the burning with the oxygen and acetylene lamps.

Reaching the ultimate consumer of the "junk" material, the metallurgist of one such (Edna Brass Company, Cincinnati) becomes spokesman for substantially all the rest:

"We could about take it for granted," he says, "that the material would be about all shot or hacked to pieces. We would simply proceed to melt it up. The melting would be no different from any other melting with which every metal worker is familiar, the different grades of metal would be melted according to very commonplace formulae for such, and results be used for castings and other obvious purposes in the end."

FRENCH METHOD OF TINNING CAST-IRON VESSELS.

A method of tinning cast-iron pots and other utensils for domestic use is offered from a French source, *"La Chronique Industrielle."* For household utensils only pure tin should be employed and not tin and lead, as the latter forms poisonous salts with the acids of food products. To insure adhesion of the tin the iron should be treated to remove the carbon, or otherwise it should be polished by mechanical means. To remove the carbon, the iron is coated with a layer of oxide of iron or manganese, or else the iron is enclosed in a box with the oxide and maintained at a high temperature to burn out the carbon. After four to six hours the iron is sufficiently decarbonized to permit the adhesion of the tin. After this procedure the iron is cleaned with dilute sulphuric acid to which is added a small amount of blue vitriol. The iron is then immersed in molten tin; or, if the interior of a vessel is to be coated, molten tin with a little sal-ammoniac is vigorously rubbed over the surface. It is preferable to heat the iron before applying the tin. This must be done with care, otherwise the surface will be oxidized and impair the adhesion of the tin.

THE GLUING OF POLISHING WHEELS

SOME LIGHT ON A PERPLEXING PROBLEM IN THE FINISHING OF METALS.

WRITTEN FOR THE METAL INDUSTRY BY B. H. DIVINE, PRESIDENT DIVINE BROTHERS COMPANY, UTICA, N. Y.

Every once in a while we receive a communication from a concern or polisher who follows the old-time practice of making his own polishing wheels by gluing together sections of stitched muslin buffs, and sometimes the inquiry relates to the making of polishing wheels by gluing together discs of canvas sewed in sections like buffs. These inquiries usually result from the disastrous experience on the part of polishers in gluing these sections together, and the same principal holds good in the case of both the canvas and the buff sections.

B. H. DIVINE.

In the first place, the polisher uses the same glue for this work that he has on hand for gluing emery on to polishing wheels, and that's his first mistake. An entirely different quality of glue is required, and a very much cheaper glue is not only required, but can be used to advantage.

The cloth in both the muslin buffs and the canvas is very absorbent and takes up the glue readily; in fact, it takes it up so fast that it is very difficult for an operator to apply the glue to each section of the wheel, the sections being usually ¼" to ⅜" thick and the wheels anywhere from 2" to 4" thick, fast enough to get all the sections under the press before the glue has soaked up into the cloth and practically disappeared from the face of the cloth sections. The capillary attraction of both the cotton cloth and cotton duck is very high and this accounts for the glue soaking in so fast. Another reason for the difficulty is that the average polisher is not equipped with the proper devices and tools for handling the work, nor with the proper materials, meaning principally the glue.

A very good glue to use for this work is what is called an "opaque" glue, this opaque glue being a glue which is loaded in its original state of solution with zinc or lead to give it weight and to prevent its being too readily absorbed when applied to cloth.

Another point is that the cloth sections should be thoroughly heated, for if the glue is applied to the cold cloth, it is immediately chilled and loses its viscosity; in other words, its stickiness, and this result, together with the soaking in of the glue, leaves the surface of the cloth with practically nothing on it to stick to the next piece of cloth in the wheel.

The use of the heavy bodied glue mentioned (the opaque glue) overcomes this condition, because even when the cloth is heated quite hot, as it should be, the glue is thick and sets on top of the surface of the cloth long enough to enable the operator to get two or three sections coated and under the press.

Another feature is the speed with which the operator can lay the glue on the surface of the sections and get them under the press, and he should not attempt to glue up all the sections at one time and make a complete wheel at one setting. It is better to put the sections together, one or two at a time, and get them under the press as quickly as possible and let the glue cool naturally and set while the wheels are under pressure, and continue this operation until a wheel of the desired thickness is built up. It, of course, takes more time to do this, but it goes a long ways towards preventing the wheel from splitting open after it is in use.

Another feature spoken of by a recent correspondent on the matter, was that he kept the wheels in a warm room for about two weeks, and, instead of helping himself, he did more damage than good, because the heat kept the glue in a semi-liquid or plastic state and helped along the natural capillary attraction of the fabric, with the result that the glue sunk down into the cloth sections and did not remain on the surface of them where the operator intended it should. This was aggravated by the wheels being kept under pressure so that the air could not get at them and set the glue while it was still on the outside of the sections, and the heat plus the pressure, worked directly against the success of the operation. After the wheels made under such conditions are built up and put into use, they look all right for a while until the operator puts pressure on the face of them in executing his work.

Now, bearing in mind that each section in the wheel is a unit by itself, and has been stiffened by the glue, the pressure of the work has a tendency to spread these sections apart and the wheel opens up and goes to pieces.

There is still another point in these matters which the polishers oftentimes do not understand, that is, the glue is being handled in this process under extremely adverse conditions. There is a standard definite formula for handling glue which is not in print and cannot be secured from any text books and glue makers do not trouble themselves to inform the users of glue as to this formula because of the time it would require and the fact that the better a man works his glue, the less he uses of it. No matter what kind of glue is being used to put polishing wheels together, it stands to reason that better results will be obtained if the process of handling the glue is correctly performed.

The best answer to this whole proposition is to discontinue this old-fashioned idea that an operator in a factory, using polishing wheels, can do this work as well as, or better than the manufacturer of such wheels, who is equipped with all the devices, has the experience of years behind him, knows what kind of glue to use for the different kinds of material in the wheels and has the experience and the facilities for handling the glue.

In the case of gluing up wheels made of canvas, all the conditions recited in this article are complicated by the fact that the canvas is not smooth. The yarn from which canvas is made is very large in diameter, the surface of the canvas is rough and by the time you get the sections covered with glue and put into the press, the glue has run down into the valleys between the high spots where strands of yarn cross one another. These high spots on the two layers of canvas being pressed together practically touch one another, and the glue on each piece

of the canvas does not come in proper contact with the glue on the other piece of the canvas.

We have manufactured these wheels in large quantities for upwards of twenty years and we are frank to say that we had our own disastrous experience on all these points which took us years to work out. We use a different kind of glue on practically every kind of material that is put through a gluing process in making up polishing wheels.

Trusting that my advice will not be misinterpreted by polishers, I would say that the best thing for the polisher to do is to buy his wheels already made up.

Nothwithstanding the advice tendered on this subject, the writer and the concern with which he is connected will be very glad indeed to give any assistance possible, to any of our polishing friends who may be encountering difficulties in gluing up their own polishing wheels or are in doubt as to what to use.

MAKING GRAY IRON CASTINGS IN A BRASS FOUNDRY

WRITTEN FOR THE METAL INDUSTRY BY W. H. PARRY, SUPERINTENDENT, NATIONAL METER COMPANY, BROOKLYN, NEW YORK.

In these troublous days it is sometimes necessary to resort to subterfuge or "camouflage" in the making of machinery, ordnance or munitions for Uncle Sam in his effort to make things unpleasant for the enemy. So that the least possible number of prying eyes would witness the feat, it was decided to make a very complicated gray iron casting in a brass foundry and the stunts pulled off there in order to insure a perfect casting of a "pinwheel bomb" so designed as to shower bullets over the last half mile of its flight, will stand telling providing the censor will permit its publication.*

The foundry, being equipped with oil-fired Anthony pit furnaces big enough to take number 100 crucibles and guaranteed to melt nickel, it was with no trepidation that the crucibles were loaded with a mixture of 70 per cent. pig and 30 per cent. of scrap iron. Care was taken that they were so loaded as to not crack the crucibles when the metal changed from the solid to the fluid state. In two hours and thirty-five minutes the crucibles were hauled out with the iron boiling hot, both were poured into a preheated ladle and from thence poured into the mold. The resulting casting was all that could be desired.

All this sounds easy, but the preliminaries that led up to the successful making of this casting were not. It was decided that the nature of the casting was not such as could be made in green sand and be sure of a sound casting, dry sand was the material used. For the benefit of those having had no foundry experience it might be well to explain the terms "green" and "dry" sand, as they are in a sense very misleading.

Green sand is the ordinary every day garden variety of molding sand, ranging from 00 to 2 in grade and rammed around the pattern in a moistened condition, but the degree of saturation is not such that the sand is to be confounded with mud. The molten metal is poured into a green sand mold without any attempt being made at drying the surface previous to pouring. Even this definition of a green sand mold is not strictly true, as green sand molds are very frequently skin-dried and become, in my estimation, a cross between a green and a dry sand mold, but as there is no short name for this class of mold, it is usually called a "green sand mold skin dried."

Dry sand molds are made of various materials, the facing, which is packed around the pattern is made of varying proportions of bank, fire, lake and coarse molding sand wet down with molasses water, sour beer, thin clay wash and flour, rye meal and crushed coke are very often added. This material is backed up with mixtures that vary according to the part of the country the foundry is located in and ranges from loam to lake sand with about every quality of sand—good, bad and indifferent in between. The backing is wet down with clay wash and the mold, when completed, is placed in a core oven and baked.

Iron flasks are used for obvious reasons on dry sand work, but green sand molds are frequently encased in wooden flasks. Because the design of the casting was what is known in pyrotechnics as a "pin wheel" of eight spokes or barrels joined at the periphery with felloes of sufficient strength to withstand the tremendous centifugal force exerted when this death dealing device is hurtled through the air scattering bullets on the Huns, advantage was taken of it and the flasks were so designed that flask pins for guiding and assembling the cope to the drag were not needed because the eight cores were set radially, projecting through the flask, thus making a perfect "pinless" outfit.

Twelve gates were formed in the cores and cope so that the molder had nothing to do but follow instructions. Risers were taken off of the end of each spoke, barrel or cannon. The cores, twenty-three in number, were made with linseed oil as a binder and brand new Rockaway sand, without any old or burnt sand added, was used throughout with splendid results. Ring core arbors of cast iron were used in three of the cores and were so light in section that they were turned in a lathe so that there could not be any variation in thickness. They were afterwards broken to pieces so that they could be taken out of the casting.

The "rigging" alone, which was used for making this one casting, cost over two hundred dollars, but once it is made it is there for all time. The patternmaking cost was close to three hundred and fifty dollars, so that all things considered it was not a job for a piker to tackle.

It is safe to say that there is not a brass foundry in existence that cannot make gray iron castings if occasion should arise, even the ones equipped with the old type pit furnaces with none other than natural draft for any furnace that will melt brass will do the same for iron, only, it will take longer.

Twenty-five years ago and over, a brass foundry in the writer's home town made a barrel of money making gas engine cylinders of gray iron, because the local iron foundries could not make two sound castings in succession those days. Everybody tried to steal the brass foundryman's "secret," when as a matter of fact there was none to steal. The whole trick being that as the foundryman used nothing but coal fired pit furnaces with natural draft, he was compelled to melt his iron slowly in crucibles, thus avoiding contact with his fuel. This gave him clean iron and sound castings, whereas the iron founders used cupolas, coal fired in those days and as every impurity that could be jammed into the coal was undoubtedly there and the same coal being thoroughly mixed with the iron, the resulting castings looked like well rotted swiss cheese and were as hard as flint at that.

*This article was submitted to the National Board of Publicity and received official sanction for publication.—Ed.

ZINCING, COMMONLY KNOWN AS HOT GALVANIZING

AN ARTICLE DEALING WITH THE MOST POPULAR METHOD OF RUST PROOFING OF METALLIC SURFACES.

WRITTEN FOR THE METAL INDUSTRY BY C. V. HENDERSON, GALVANIZING EXPERT.

Hot galvanizing is one of the oldest of the rust-proofing processes. Many substitutes have been offered to the trade in the past few years. Doubless some of them have real merit and a field of usefulness, all of them are certainly cheaper and practically all depend on the same medium, zinc, for their rust resisting qualities.

All sorts of chemical tests have been devised to prove that these newer methods are the equal of the older one, but the real test of time, weather, and rough usage, shows that the old hot dip galvanizing is still supreme.

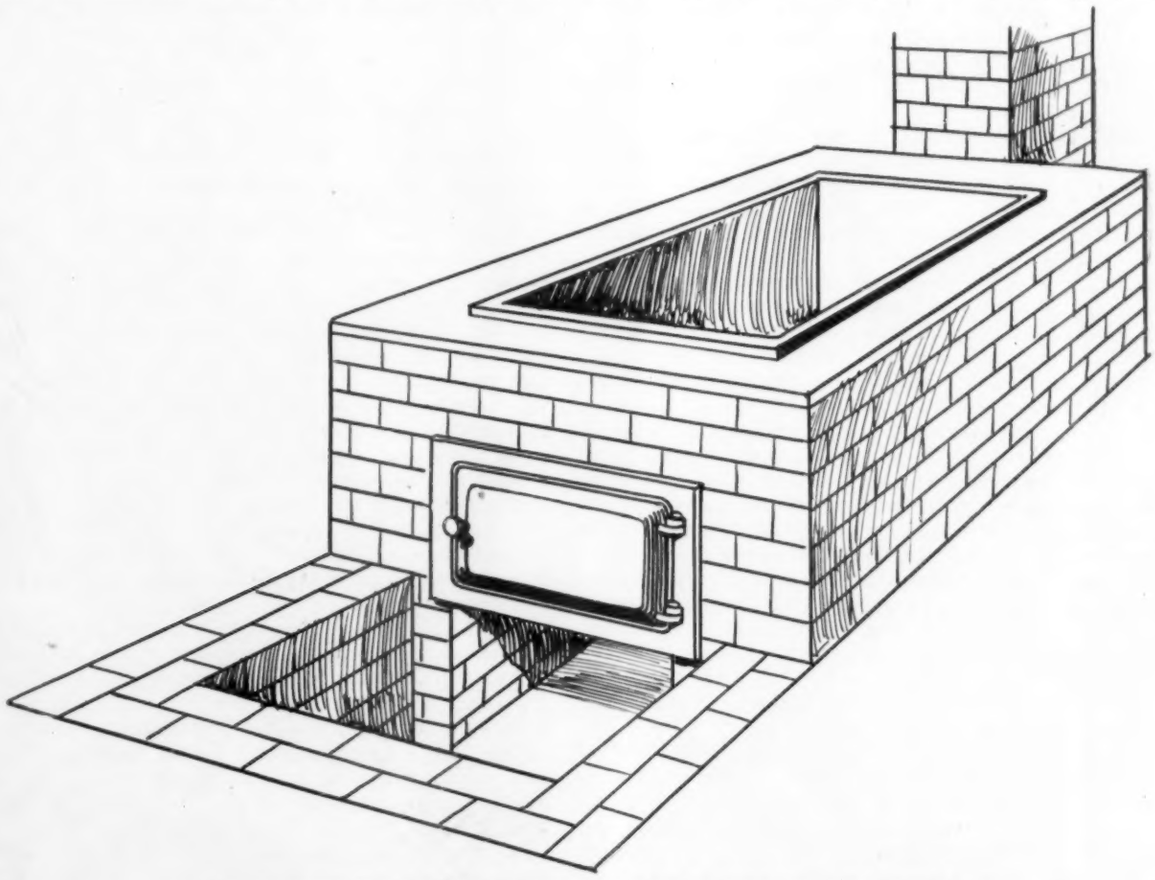
Our large telephone companies, our marine hardware and sheet manufacturers, all recognize this superiority, and apparently the U. S. Government does also, as in the specifications for war materials to be made of iron and steel, we are constantly finding the words, "To be galvanized by the hot process."

Unless the manufacturer happens to be located in one of the larger cities, he is very likely to be subjected to considerable extra expense, inconvenience and delay in getting the work done satisfactorily, and in many cases is obliged to install his own plant. Before doing so he naturally wants to know something about the process, what apparatus is required, what materials are used, and a general idea of the operation itself. Inquiry reveals the fact that very little has been written on the subject, and that reliable sources of information are exceedingly limited. Without going into detail I will try to outline the process.

Hot galvanizing is merely a method of covering the surface of iron and steel with an adhesive coating of zinc, and is accomplished by dipping in a bath of the molten metal. Its principal use is to prevent rust, but manufacturers of malleable and grey iron castings find it an excellent way to seal the pores of castings that are to be used to retain gas, oil, steam and water, thus insuring against leakage.

Before galvanizing it is necessary that the surface to be treated is clean and free from sand, scale, grease or other foreign matter. Cleaning is done by the use of acids and is generally called "pickling." In the larger plants this is a separate operation, but in the smaller ones it is considered as a part of the galvanizing operation and I shall so consider it here.

The apparatus consists of several wooden tanks for acid solutions, water storage and cooling, a suitable arrangement for drying the work after pickling, a galvanizing kettle for the zinc bath, and various tools for handling the work through the zinc. These tools are tongs, hooks, wires, rods and baskets of sheet iron or wirecloth. The size of the apparatus and the nature of the tools required is determined by the size and nature of the work to be galvanized and the output desired.



A COAL-FIRED "ZINCING" OR HOT GALVANIZING FURNACE AND KETTLE.

Serviceable tanks may be built of Cypress with Oak battens and bed pieces, fastened together by rods through sides, ends and bottom. Copper rods should be used in acid tanks, iron will answer for others.

Drying arrangement may be a flat iron plate, with heat applied under one end only so that the work may be quickly dried and transferred to the cooler end where it may be kept warm without overheating. An oven is often used for this purpose, but where large quantities of small articles are to be handled, the flat plate has many advantages.

Galvanizing kettles are usually built of firebox steel and of widely varying form, size and construction. Seams are either welded or rivetted. When rivets are used care must be taken in setting the kettle in the brick work that the rivets are not exposed to the action of the fire. Fireboxes are built in a way that will allow of the heat being applied evenly along both sides of the kettle for its entire length but not on the bottom.

A galvanizing plant is best housed in a building by itself, as the fumes from the operation are not only ruinous to machinery and tools, but are also very objectionable to workmen employed in other lines. Good overhead ventilation is absolutely necessary as is also drainage. A floor of brick or concrete will prevent loss of metal. Running water and steam should be supplied.

Materials for ordinary work are: sulphuric, hydrofluoric and muriatic acids, potash or caustic soda, zinc or spelter, sal-ammoniac, glycerine, aluminum, water and fuel.

Sulphuric acid diluted with water is used to remove scale from wrought iron and steel. Hydrofluoric acid in the same way to remove sand from castings. Caustic soda will take care of grease and oil. To accelerate the action of these solutions they are heated by the introduction of live steam.

A strong solution of muriatic acid and water is used on all work as a final clearing dip before galvanizing, as it not only takes away all scum and light oxide that may accumulate after pickling, but also leaves on the surface a slight deposit of chloride of iron, which materially aids the adhesion of the zinc.

Spelter or zinc is melted in the galvanizing kettle to form the zinc bath which is kept full of the molten metal at all times to within one or two inches from the top. The temperature of the bath when not in use is not allowed to go much higher than the melting point. When galvanizing, it must be regulated to the work in hand.

Fuel must be of a nature that will supply a steady even heat for several hours at a time and that can also be easily controlled. While coal, oil and gas can be used, coke of the gas-house or soft variety appears to be the most satisfactory for this purpose. This fuel requires no burners, grates or flues, is easily obtainable and has the least injurious effect on the kettle.

On part of the zinc bath there is made what is called a flux of sal-ammoniac and glycerine. A small quantity of sal-ammoniac is placed on the surface of the molten zinc, a few drops of glycerine are added and mixed with it by means of a small iron paddle, more sal-ammoniac and glycerine are added until about half the surface of the bath is covered. This flux is black in color and can be made thick like soapsuds or as thin as water by varying the proportion of its contents. When it becomes dirty from the passage of the work through it, it must be removed and a new one made.

The flux will spread rapidly over the surface of the zinc and to keep it within bounds, a movable sheet iron partition called a flux guard is placed across the bath and extending down under the surface, thus leaving one end covered with flux and the other end clear metal.

Plenty of flux on the bath insures a smooth adhesive coating and helps to prevent the hot metal from flying out of the kettle and burning the operator.

There are four factors that enter into the success of the operation and may be classed as follows: First, thorough cleaning of the work without over pickling or burning in the acids. Second, quick drying without overheating. Third, proper regulation of the heat of the zinc bath to the work in hand. Fourth, careful handling and maintenance of the flux.

With a thorough knowledge of these four points, a galvanizing plant will be a source of pride and profit, otherwise it is very likely to become a nightmare and a very expensive experiment.

The actual operation is very simple. The article to be treated is first "pickled" by immersion in the solution or solutions adapted to its nature, carefully watched to denote progress, spots that will not readily respond to the action of the acids helped by a scratch brush or file, and when clean and free from sand, scale and grease placed in a water storage tank to remain until wanted for the next operation.

The next step is to immerse for a few minutes in the muriatic clearing tank, placed from there to the hot section of the drying plate where it is thoroughly dried. At this stage the work will be of a gray color and covered with a fine white deposit. It is transferred to the unheated end of the dryer, placed on a wire, hook, rod or in a basket, and is ready for the zinc bath.

The article is passed slowly and steadily down through the flux into the molten zinc, and kept there with an occasional passing up and down through the flux called washing, until it is covered with a smooth thin coating of the metal. When ready to leave the bath it is passed over the flux guard and into the clear zinc. Any scum or oxide that may have accumulated on this surface is skimmed or swept away with a small paddle of wood or iron, the bath is dusted lightly with fine sal-ammoniac, and the piece drawn slowly and steadily from the metal, given a quick shake or snap to remove the surplus zinc, and passed into the cooling tank of clear water to set the coating. When cooled it is rubbed in dry sawdust to absorb the moisture and the operation is complete.

Where a particularly bright finish is desired, a few ounces of aluminum, or one of the many patented preparations for this purpose, are added to the clear or drawing end of the zinc bath, the sal-ammoniac dusting is omitted, and the work drawn from the clear metal. It is claimed that the use of aluminum results in a thinner coating, and a consequent saving of metal.

The finished work should be removed to another room as soon as practical, as the fumes of the acids and sal-ammoniac will soon spoil the appearance of the coating.

Spelter under heat, and in continual contact with iron will form a dross, which being heavier than the clear metal, settles in the bottom of the kettle. This dross has to be removed at frequent intervals, and a long handled scoop is made for the purpose. The scoop is passed down through the metal, the dross brought to the surface, the free zinc allowed to drain from the mass, back into the kettle, and the dross, while still hot is molded into cakes or slabs, in heavy cast iron forms, called dross pans. Part of the metal can be reclaimed by a process known as sweating, but in the smaller plants at least, this is not profitable, and it is sold to the refiners.

The fact that this dross accumulates quite rapidly, makes it advisable to have a galvanizing kettle somewhat deeper than would appear to be necessary from the size of the goods to be treated. If the dross becomes stirred up while work is being passed through the bath, it will soon permeate the whole body of metal, causing the finished product to have a thick, rough coating, of poor color, and of little value, and the cost will be materially increased.

NOTES ON THE CRUCIBLE SITUATION

FROM A PAPER READ AT THE BOSTON, 1917, CONVENTION OF THE AMERICAN INSTITUTE OF METALS. THIS MATTER IS NOW AVAILABLE FOR THE FIRST TIME.

BY A. V. BLEININGER, BUREAU OF STANDARDS, PITTSBURGH, PA.

The graphite crucibles used in the melting of brass, steel and various alloys consist essentially of a mixture of graphite and clay, which is shaped, dried and fired to a moderate temperature usually at or below 950° C. The properties of the graphite which render it so valuable in connection with this use are its refractoriness which to a certain extent is imparted to the clay bond, its reducing effect, which prevents oxidation of the metal and its high thermal conductivity which makes possible rapid fusion of the charge. In addition the smoothness of surface which it imparts to the crucible permits the clean pouring of the metal.

The function of the clay is that of a bonding material which makes possible the shaping of the crucible and the cementing together of the graphite flakes, at the same time it covers the particles and thus protects them from oxidation. In order to be most effective in regard to this point it is necessary that the clay contracts and becomes dense at as low a temperature as is consistent with the required refractoriness.

The manufacture of graphite crucibles consists in thoroughly grinding together and blending the graphite and clay, tempering with water in a suitable mixing machine till the mass has assumed the proper plastic consistency, shaping the crucibles by means of a pottery jolly, drying and finally burning them.

Graphite occurs in nature in several forms, more or less admixed with impurities. It occurs in the older crystalline rocks, gneiss, schist, crystalline limestone, granite and sometimes in carbonaceous shales and slates. Though often occurring in small flakes throughout schist as in Alabama it is also found in vein like deposits of considerable thickness. Of this character are the occurrences in the Laurentian rocks of New York and Canada, the graphitic gneisses of the Eastern Alps, the granulites of Ceylon and the granites in Irkutsk, Siberia. Massive graphite occurs also in the Sonora district, Mexico, at Borrowdale, Cumberland (England), Passau (Bavaria), Schwarzbach (Bohemia), in Portugal, and in the province of Minas Geraes (Brazil). The Mexican graphite mines are considered the richest in the world. In point of quality for the manufacture of crucibles the Ceylon graphite is considered the best, and enormous quantities are exported from there to Europe and the United States. In this country the best known deposit occurs at Ticonderoga, New York, but a large number of occurrences are to be met with in a number of states as in Alabama, California, Pennsylvania, Georgia, North Carolina, New Hampshire, Rhode Island, Montana and Virginia. Canada likewise possesses extensive graphite deposits. Large developments are under way at the present time in Alabama. In most American deposits the graphite occurs in small flakes interspersed in mica schist or similar rocks. The content of graphite scarcely ever exceeds 8 per cent and it must be removed from the rocks by means of the usual methods of ore dressing. Of late, oil flotation processes and electro static separation have been adopted successfully. As a rule the domestic graphite is not as massive as the Ceylon product consisting either of small flakes or on the other hand being more of a granular, amorphous character. The Ceylon graphite possesses to a marked degree a characteristic foliated structure combined with a low content of ash. Graphites differ widely in composition and considerable variation is even observed in the Ceylon material. The purest grade of Ceylon graphite has been found to contain 98.87 per cent carbon, 0.90 per cent volatile matter and 0.28 per cent ash. Frequently, however, shipments show a carbon content of 79.4 per cent and 15.5 per cent ash. In all graphites used for crucibles the ash content is of considerable importance especially with reference to the amount of iron oxide present. If this constituent is too high it is apt to cause more rapid corrosion of the crucibles. Graphites have been examined in this laboratory which contain as high as 40 per cent of ash and 10 per cent of iron oxide. For the manufacture of graphite crucibles the Ceylon chip and flake graphite is undoubtedly the best since practically no other material equals it in regard to both the most desirable type and uniformity of structure. There is no reason, however, why the Ceylon graphite cannot be used admixed with some domestic product; in fact, up to 20 per cent of the latter and perhaps higher.

BOND CLAYS FOR CRUCIBLES

Up to the beginning of the present war the clay used almost exclusively as a bonding material for graphite crucibles was that from Klingenberg, Bavaria. This clay is of a dark-bluish color and possesses marked plasticity and bonding power. When made up with water it is of "sticky" consistency and is capable of cementing together a large volume of non-plastic material such as graphite, to form, upon drying, a tough, strong body. It has been claimed by Scheid that the structure of the clay grains resembles that of fine mica, showing crystalline forms or fragments of such. This scaly structure, approaching that of graphite is thus said to bring about a condition of strong cohesion between the two materials. At the same time the clay appears to be quite high in organic matter. Unmixed with non-plastic material it has a decided tendency to check and crack in drying. There are several grades of this clay which differ somewhat in their properties, and when marketed it does not possess the uniformity of composition which has been claimed for it. Some of the chemical analyses given for this clay are as follows:

	1	2	3	4	5
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Silica	50.76	49.00	54.06	56.62	47.49
Alumina	29.26	32.62	33.11	29.09	34.94
Ferric oxide	1.51	1.58	1.50	1.78	2.63
Titanium oxide	1.61	.....	.....	.....	.....
Lime	1.08	0.52	0.49	0.73	1.04
Magnesia	0.73	.....	0.45	}	}
Potash	0.85	0.73	1.37	0.79	1.13
Soda	0.19	.....	.....	.....	.....
Loss on ignition	14.24	.....	9.12	11.03	12.77

From an analysis of the Klingenberg clay made in this laboratory it appears that it is composed of about 80.64 per cent of clay substance, 12.86 per cent of fine quartz and 6.50 per cent of feldspar. In addition to its excellent plasticity and bonding power this clay possesses the property of burning to a dense structure at a comparatively low temperature, about 1125° C., thus enveloping and protecting the graphite from oxidation. Furthermore it is quite refractory showing no giving way or decided softening at temperatures up to 1400° C. When admixed with graphite its resistance to high temperatures is increased still more and it begins to soften only when the graphite is burned away in larger quantities. It is quite likely that at the maximum furnace temperatures silicon carbide is formed due to the reaction between the silica of the clay and the graphite. The

green patches sometimes observed on graphite crucibles would tend to indicate such a condition.

TESTING OF BOND CLAYS

In the study of clays it soon becomes evident that the chemical composition plays but a minor role. It is impossible to foretell anything concerning the physical properties of a clay from its composition excepting the refractoriness which can be estimated quite accurately. For this reason it is evident that tests of the physical properties are of far greater significance. It might be well to consider some of these together with simple tests devised for their numerical evaluation.

One of the first constants we desire to know about a clay is the amount of water required to impart to it the consistency known as normal consistency. By this we mean the condition in which the clay is neither too stiff so that it cannot be molded and shaped readily nor so soft that it will deform by its own weight. It should not be so soft that the clay will stick to a bright nickel knife or spatula. The experienced operator will hit this condition with considerable accuracy but unfortunately we have no device for gauging it with absolute accuracy. The Vicat needle used in cement testing has been suggested for this purpose. It is surprising, however, how closely an experienced operator can check his work in obtaining practically the same consistency. In determining the water content, then, we must make up a briquette of the plastic clay, weigh it at once and dry it. The final drying should take place at a temperature of 110° C. The calculation involved is a very simple one and consists in subtracting the weight of the dried piece from its weight in the plastic state and dividing by the dry weight of the specimen. This result multiplied by 100 gives the percentage of water required by the clay, in terms of its dry weight. As a rule the higher the required water content of a clay is the more plastic the material is, but if this value becomes too high the plasticity becomes stickiness which is not so desirable. The Klingenberg clay known as A. T., requires a water content of 39.68 per cent, that designated as E. T., 50.66 per cent. The latter shows a decided tendency toward stickiness.

The quality of clay known as its plasticity or the property of permitting its molding and shaping we have as yet not been able to express numerically by means of test results. All we can do at the present time is to estimate this quality by feel or by some indirect determinations. Thus we have already seen that the amount of water required to render clay plastic is a measure of its plasticity. Similarly, the shrinkage in drying is a criterion of this quality. Other means of estimating plasticity indirectly are the capacity of clays to absorb certain dyes like malachite green, the time required for the dried clay to slake down in water, the tensile and transverse strength of dried bars of clay and the fineness of the clay, with reference to the amount of material which fails to settle in water after standing for some time.

The drying shrinkage is determined either by linear or by volume measurements. Since clay never shrinks uniformly in all directions, the shrinkage determination by volume is much more accurate and reliable. For this purpose the plastic clay is made up into a briquette which is at once immersed in petroleum and the volume of which is later determined by means of a simple apparatus known as a voluminometer. The specimen is allowed to dry and is again immersed in petroleum. After standing for some time so that it is saturated with the liquid, its volume is once more determined. Evidently, the volume in the wet state, minus the volume in the dry state, divided by the dry volume, the result being multiplied by 100 gives the percentage volume shrinkage in terms of the dry volume. This value is for the A. T. Klingenberg clay 42.58 per cent, and for the E. T. brand, 55.05 per cent.

A simple method for estimating the plastic character of clays consists in grinding them together with potters' flint in the proportion of 1: 1, making them up to a plastic mass, and forming one inch cubes. After drying these thoroughly and immersing them in water, the time required to slake the clay down to a mud is characteristic of the structure of the clay. Heavy, "fat" clays will break down very much slower than lean, and less plastic ones. The slaking time for the Klingenberg clays A. T. and E. T. is 78 and 108 minutes, respectively.

The mechanical strength of dried specimens of clay prepared from the unmixed material, or from a 1: 1 mixture of clay and sand is another means of estimating indirectly the plasticity and bonding power. This is especially true when the sand mixture is used, owing to the fact that some of the very "fat" clays are apt to check and crack in drying, without the addition of a non-plastic. The tensile strength is determined upon specimens made in the form of cement test briquettes which are broken in a suitable machine. The transverse strength test which is now made more commonly, employs bars 7 in. x 1 in. x 1 in. which, when dried, are loaded at the middle and broken. From the dimensions of the bar, the span and the load the modulus of rupture is determined, expressed in pounds per square inch. For the Klingenberg A. T. clay, mixed with sand in the proportion of 1: 1, the modulus is 381, and for the E. T. material 363. The higher the strength is, the greater should be the plasticity and the bonding power.

The fineness of the clay with reference to its finest particles; i. e., grains of the magnitude of 0.01 to 0.003 mm. is indicative in general of the content of the dispersed or colloidal portion, but is not necessarily a function of plasticity. Thus, by carefully elutriating Klingenberg clay, using a current of water with a velocity of 0.18 mm. per second, 54.6 per cent by weight of the material was removed. Another clay, however, decidedly less plastic, was found to be considerably finer, since 90.8 per cent could be removed by the same treatment. Plasticity, therefore, is not merely a matter of fineness.

The apparent specific gravity of the dried clay is sometimes useful in comparing different materials. For the Klingenberg clays, it has been found to vary from 1.79 to 1.70.

(To be continued.)

BLACK FINISH ON STEEL.

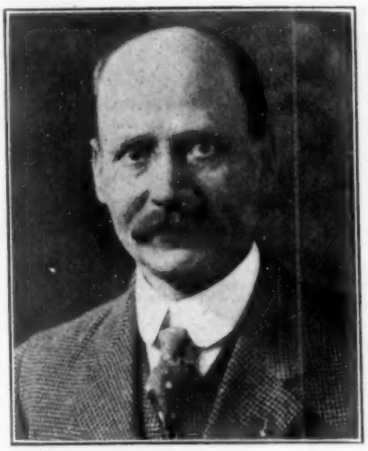
Prepare a saturated solution of caustic soda and add a small amount of saltpeter, say a small handful to a five gallon solution. Boil the solution for a short time and allow it to cool over night. The clear liquid should only be used and this should be brought to the boiling point in an iron kettle. The articles should be wired as for plating and immersed in the blackening solution. The articles will take on a grey color at once with black underneath and should be left in the solution until the grey finish disappears and a beautiful black remains. Rinse the articles in cold water, dry in sawdust and oil with linseed oil and wipe clean. The resulting finish will be a fine blue black that wears well, is superior to black nickel and is suitable for shears, razors, etc.—L. C. B.

RUNNING THE METAL BUSINESS ON HIGH GEAR

Improving or Keeping up Efficiency in Metal Polishing and Buffing Departments

By P. W. Blair, Mechanical Editor The Metal Industry.

There has been a great deal of discussion, for the past few years, regarding efficiency and production in the plating department, but there has been very little discussion or articles written in regard to the polishing of the metals or buffing processes before and after electroplating. Polishing forms an important factor in the manufacture of stoves, tools, mechanic's implements, cutlery, builders' hardware, automobile parts, electric appliances, typewriting machines, calculating machines, fire-arms, plumbing and steam brass goods and engineering appliances.



P. W. BLAIR.

Polishing and plating of metals for all ordinary purposes are often unfortunately regarded as being trades or professions which may be ordinarily mastered by any one man who may be capable of becoming an adept in either one or the other. Under certain restricted conditions this is true, but generally speaking a good polisher seldom develops into a good plater and a good man who has studied all of the arts in electro-plating, until its possibilities have been properly grasped, seldom becomes, if ever, an efficient metal polisher. The two occupations are essentially remote from one another, although closely allied. In many industrial plants devoted to the manufacture of polished and plated ware, the polishing and plating comes under one man's supervision. However, such is not the case in plants turning out high grade lines of metal goods which have become standard in regard to finish and durability of the electro-plate. These plants have realized the importance of employing foremen who have become specialists in their particular branch of the business for the respective departments.

SPECIALIST BEST IN SOME PLACES

In order to make a success a foreman cannot be tied up to two or three branches of the business. He can, however, make a success of one branch and develop it up to the highest efficiency, but he should not be averse to actually engaging in the different operations under his supervision when circumstances require it. Wet or dirty hands will not reduce or reflect on a foreman's efficiency. If a polisher is given new parts to polish and does not readily adopt the quickest and best methods of finishing the operation he then should be able to demonstrate the process he wishes employed. A good plan is to have an alloted number of pieces govern the days work and for all over and above that amount that are finished, a bonus should be given the workman thus cutting out the obnoxious piece work system which has caused more trouble and strife in polishing and buffing metals than any other question.

CARE AND SELECTION OF TOOLS IMPORTANT

The foreman must teach his men to keep their wheels* in first class condition and see to it that they do. A few years ago wooden wheels covered with leather and turned to fit the piece to be polished were almost universally used. At the present time the wooden leather covered wheel is used largely on flat surfaces and on work where it is necessary to maintain square edges. When this kind of wheel is made with a double coating of leather it becomes a good finishing wheel. Compressed wheels or ones having a steel center and made with surfaces of leather, canvas or linen are used largely on cutlery and for polishing chilled plows. The compressed wheel is of strong construction, durable and is easily kept in balance.

Where a high grade polish is required there is probably no other wheel that can compare with those made of walrus. These are used largely on guns, pistols and cutlery. As walrus or sea-horse wheels are expensive a great many concerns which use a number of them each year buy the hides and make their own wheels. Bull neck wheels are made of specially tanned bull neck leather, built up of solid leather discs and are adapted for polishing stove trimmings, brass goods, tools, etc. Sheep-skin wheels are made of discs of sheep-skin which are stitched or cemented together to form a solid wheel. The loose wheels are adapted for polishing uneven surfaces and the stitched wheels, which are pliable and resilient, are used for fine polishing. Solid or cemented wheels are used for fine polishing when the surface of the articles are not too uneven or irregular.

Canvas and muslin wheels are made either loose stitched or solid depending upon the resiliency or pliability required. Wheels used for polishing irregular surfaces should be pliable in order that the polishing medium will come in contact with every corner and curve of the work. Canvas and muslin wheels are used extensively for the polishing of stove trimmings, shovels, plows, brass, cast iron and steel. They are also universally used for roughing on irregular articles as they hold the abrasive well and need no washing off as they can be cleaned with a buff-stick or an abrasive brick. Many concerns have found it advisable to buy the canvas and make their own wheels. The well known felt wheels are made from Spanish and Mexican felt and are extensively used for finishing and are used by most stove concerns together with the bull neck wheels, to obtain a smooth finish before plating.

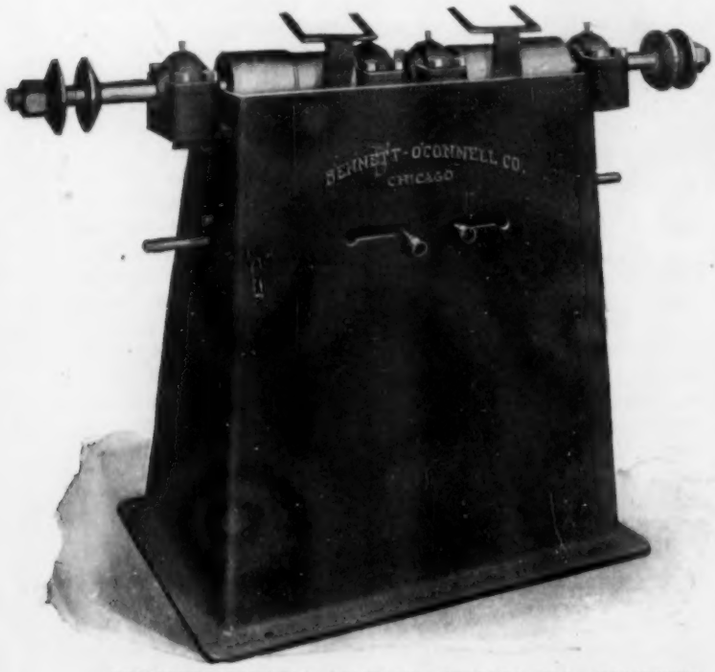
One of the most important factors in polishing in order to obtain first class work is to be sure that the polishing wheels are balanced correctly. Balancing ways are made for this special purpose and the balancing is usually done by nailing pieces of sheet lead on the light side of the wheel until the wheel remains at rest in any position on the balancing ways. It is also important that the wheels run true and by using an old file or a buff stick supported by a temporary rest the whel can be made to run so that every portion of its surface will come in contact with the work.

POLISHING MATERIALS OF CLEVER SORTS

Several modifications of belt type machines are in use and these consist essentially of two flanged pulleys carrying a canvas belt. These are called strapping machines and at one time were used exclusively in polishing. The

*A full description of polishing wheels and their care was published in The Metal Industry, January, March and July, 1915.

straps or polishing belts run at speeds of 2,000 to 2,500 feet per minute and are very effective for finishing irregular surfaces, such as plumbing and steam goods, where the surfaces to be polished are inaccessible with the polishing wheels. Experience will show that the finer woven belts hold the abrasive material better than the coarser woven. When setting up or covering a polishing wheel the best materials should be used as follows: Turkish emery, alundum, crystolon or carborundum. There is a difference of opinion in reference to the brands of abrasive that can be employed, but it will soon develop by experience which gives the best results. It is also essential that the best and most superior quality of glue be used, the cooking being done in a water jacketed pot and



BENNETT-O'CONNELL COMPANY, CHICAGO, ILL., POLISHING LATHE.

the temperature never allowed to go beyond 150 degrees Fahr.

There are no general instructions as to the quantity of glue that should be used, but as a rule one pound of glue to one pound of water will be found to work satisfactorily for holding the grains of wheels from No. 20 to 45 and for the finer numbers it is usually found desirable to thin the glue down somewhat. After the wheel has been coated with the abrasive it should be allowed to dry at least twelve hours, but in a great many cases the time will have to be varied to suit conditions. A great deal could be said regarding the proper abrasive to use in in polishing metal, but the best advice that can be given is that cheap abrasives and cheap glue should be avoided, and that nothing but the best grades of either should be used. It is useless to attempt to set up wheels with using cabinet or other inferior glue, as it will soon be found that it is a waste of time and labor, for it will not hold out against the strain of abrasion, and the wheel will finally have to be sacrificed.

A suction system of adequate capacity, together with true running lathes equipped with suction hoods are very essential in polishing if a maximum production is desired.

GENERAL INSTRUCTIONS FOR FOREMEN

A foreman should try out various samples of wheels and supplies personally in order to know the grade best suited to his specific requirements. The supply salesman or the purchasing agent will tell him that a certain line of supplies are absolutely the best on the market, and will name over a half a dozen firms who are using the stuff. Perhaps he is right, but he seldom has everything up to the standard, therefore, do not take the supply salesman's word or that of anybody else, but find out for yourself. A personal test will give the foreman a basis upon which to figure, for he can then reckon the costs from various angles, and thus increase the efficiency of the department. If the material to be polished is brass,

HANSON, VAN WINKLE COMPANY, NEWARK, N. J., POLISHING LATHE.

which is taken from the 120 emery dry to the buff, and you cannot satisfy yourself that this is the best method, then try oiling the brass, using a compressed canvass wheel, and it will be found that over seventy-five per cent. of the brass work that is polished can be treated with less expense in this manner. The substitution of compressed wheels for felt wheels will lower the burden rate in the polishing department very noticeably.

Many polishers are careless with the wheels and sup-

MUNNING-LOEB COMPANY, MATTAWAN, N. J., DOUBLE SPINDLE POLISHING LATHE.

plies, and consider the operation of balancing their wheels a trivial matter, which results in inefficiency. They are not responsible for the supplies, and so do not intend to use their brains in attempting to assist the foreman, therefore it is wise for the foreman to be on the watch in order to keep the burden rate of his department low. Owing to the enormous prices now being charged for polishing supplies, the time is now ripe for the conservation of supplies, and therefore it will be the means of

putting everything in the polishing department on a more economic basis.

There are quite a number of things which combine to make the polishing department an important branch of the metal business. The quality of the polishing will affect the sale of goods to a large extent, so it is important that the goods be turned out in first-class condition and at as low a cost as possible. If the articles are not turned out just so, find out if it is inadequate use of the equipment or in some improper method of operation. The nature of the work will determine to some degree the proper speed necessary for polishing wheels, but for ordinary operations it is the practice to employ a peripheral speed of about 7,500 feet per minute. If the speed of the wheel is too slow, the work tends to tear the polishing material from the wheel too readily, and consequently the work suffers in quality, and the wheel has to be set up more often. If the diameter of the wheel and the dimensions of the work are small, good results can be secured with lower wheel speed. Loose muslin wheels used in buffing operations are operated at peripheral speeds of from 8,000 to 10,500 feet per minute.

The above points do not nearly cover the entire range of efficient methods that should be used in the polishing room, but they are some of the prominent ones, and by the adoption of some of them it will assist the foreman on the question of increasing the efficiency of his department.

CASKET HARDWARE ELECTRO-PLATING AND FINISHING

SOME VALUABLE INFORMATION RELATING TO TREATMENT OF SOFT METAL CASTINGS.

PAPER READ AT ST. LOUIS CONVENTION OF THE AMERICAN ELECTRO-PLATERS' SOCIETY.

BY HARVEY MILLS, NEW YORK BRANCH.

On the subject of plating and finishing casket hardware which is composed of the well-known antimonial lead alloy, I will describe the methods of plating and finishing which I find, from experience with this class of goods, to be the most satisfactory. As there is more or less difficulty with a soft metal of this kind in the process of plating, especially as it is finished to a high color and must be free from stains and blisters, I will describe the different processes of plating and finishing these goods in large volumes, day after day, with comparatively small percentage of loss. The molds for casting the metal are composed of a bronze alloy and are kept in condition by polishing smoothly, so as to produce the castings as smooth as possible and in good condition for buffing. I will not go into detail in regard to the casting of this metal, for the method is very well known, but will proceed with the polishing and plating processes. The better class of goods are cut down on a cloth wheel with tripoli and colored on a sheepskin wheel with crocus or any suitable polishing composition. A large percentage of the goods are finished on one wheel and a satisfactory color obtained. The work is polished more rapidly than by the sand-buffing method which has been discarded in this line of work, and the finish obtained is as satisfactory. The work is inspected before leaving the buffing-room, to see that it is properly finished and free from buffing composition; then delivered to the plating-room. The castings are plated on iron racks, which hold from 60 to 120 pieces, according to the size and shape. The large pieces are plated sixteen to the rack. The castings are racked, care being taken in handling to avoid scratching and finger-marks. The cleaning is a particular feature. The potash should be a clear solution, about 4° B. The strike or electric cleaner is composed of cyanide, 3 to 4 ounces to the gallon, and copper anodes with 5 volts and about 90° F. This will remove lead oxide and stains on the castings formed by the potash and contact with the air, also the remaining grease, and will prevent blistering of the plate. An excess of cyanide in the strike will produce a slight roughness on the polished surface, due to iron in the cyanide.

The racks of work are dipped into the potash (not necessary to remain in), rinsed in cold running water, and hung in the electric cleaner for about half a minute, rinsed, and then put into the nickel solution.

For brass and copper finishes the work is struck heavy in the electric cleaner and given 20 minutes' nickel-plate before brass or copper plating. The nickel and silver tanks have a capacity of four racks of work to the batch and are 160 gallons each. The nickel solutions are of double nickel salts and are maintained slightly alkali. The silver solutions should contain a sufficient amount of free cyanide for the pieces to receive a uniform deposit plated on large racks, about 12 ounces cyanide and 1½ ounces silver per gallon. The strike solutions, about the same amount of cyanide and ½ ounce of silver per gallon—silver supplied from the anode. About 5 volts for the strike solutions and 3½ volts for the plating bath. For the brightening agent, prefer to use the carbon cut down with ether, ammonia and cyanide. Have an agitator attached to the work-rod of the silver tanks, which is not absolutely necessary, but assists in brightening the deposit where the batches are run a short time. There are two nickels to each silver solution. The batches are plated 8 to 10 minutes in the nickel, rinsed in cold water, struck up and hung in the silver-plating solution, and another batch placed in the nickel. The silver is run 5 minutes, rinsed in cold and hot water and placed in the heater, when the batch from the second nickel is struck up and the tank refilled.

Oxidize and antique silver are run 15 minutes in the silver. Solution for blacking antique silver is composed of 3 ounces sodium sulphide per gallon and 1 ounce perchloride of iron to about 40 gallons. This produces a soft black easily relieved.

There is a big demand for hardware finished in nickel. I use bright nickel solutions for this work, which comes from the bath as bright as when buffed. The solutions are composed largely of nickel sulphate, boracic acid, sodium chloride and magnesium sulphate, and occasionally sulphuric acid as is needed. A small amount of cadmium chloride or gum arabic can be added to improve the bright deposit. The silver is buffed to a high color without cutting through the plate. The pieces are rouge-buffed on a cloth or a filled wheel, and colored on a soft wheel with powdered rouge, alcohol and a glycerin mixture. The glycerin removes the rouge from the silver, leaving a white background, and the color is equal in appearance to a burnished finish. The glycerin is cut down with alcohol and ammonia—to 10 ounces of glycerin, 1 ounce each of ammonia and alcohol. A small amount of this is mixed with the rouge and alcohol and applied to the color wheel.—Monthly Review, American Electro-platers' Society, October, 1917.

ELECTRO-PLATING AND ITS RELATION TO THE MANUFACTURE OF PHONOGRAPHS AND PHONOGRAPHIC RECORDS

A Series of Articles Giving Practical Information Regarding the Finishing of Metal Parts. Part I.

Written for The Metal Industry by S. Herrick.

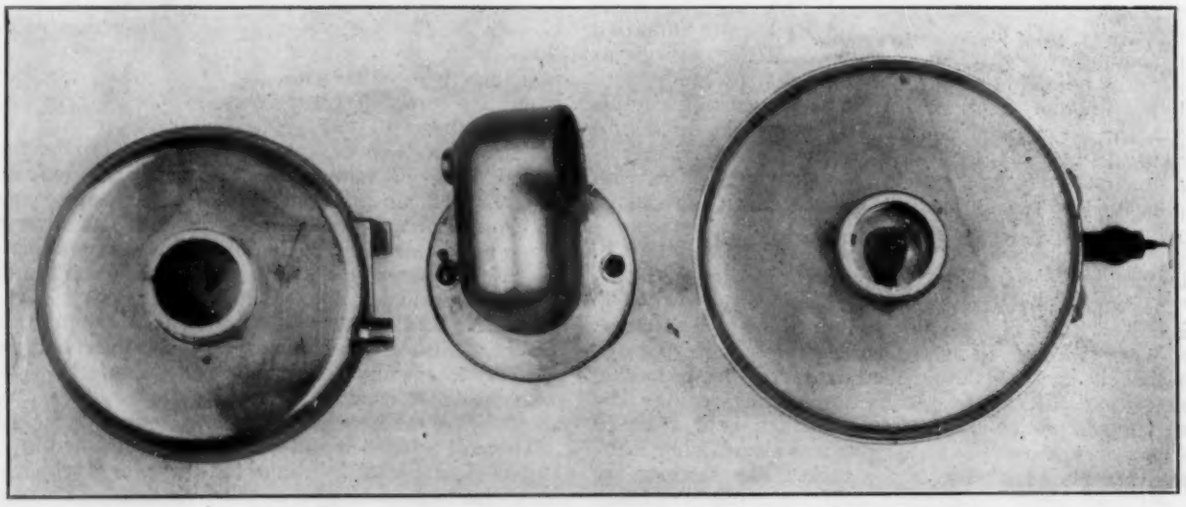
S. HERRICK.

As we look back into the past history of the electroplating industry we view many wonderful changes that have taken place. For instance, the old battery is a thing of the past as it has been replaced with a dynamo which, with the proper care, is the joy of any plater, for he knows that it will do the work it is built to do and also do it well. A voltmeter has taken the place of an old file and there are but few places where the old system of scraping a file across the conductor rods is in use at the present time, though the writer does know of a few concerns that still use the old system, which I consider like trying to run an engine without steam.

Then there is the ammeter whereby it is possible to register the load of the solution and while this instrument is very delicate it never fails. Again I look back to the days when I was a boy in the shop and spent many an hour wiring small articles, which to-day are handled in bulk in the plating barrel, a machine that can plate as many articles in one hour as it would take a boy a week to wire. It is also true with all the solutions used in plating, from the nickel right down the line through the black nickel, steel, brass, bronze, copper, silver or gold. Such improvements have been made in these solutions that to-day a plater of twenty years ago would hardly know some of them. Many are the troubles that a plater had to face in those times which are unknown to-day, but as the troubles of days of old have passed so with new industries and new improvements will new problems have to be solved.

However, there are two lines of plating which, at the present time, are in their infancy and which I will try to describe as plainly as possible in this article. The first one is in the plating of the different parts of phonographs which are generally finished in either gold or nickel. You no doubt have often listened to your phonograph play some of your favorite records and thus had the machine continually before your eyes, but as you listened to the music have you ever stopped to consider the enjoyment the platers have had in the past and are having at the present time in plating some of the parts that give such a pleasing appearance to the machine. It is true that some of the parts are made of brass, especially the tone arms, while the turntable is made of iron, but the reproducer is a die casting. Some manufacturers are now making tone arms out of die castings also. There are few platers at the present time who will say that there is fun in plating die castings, although a great many of the difficulties encountered have been overcome.

The Metal Industry in September, 1915, published an article by the writer covering the plating of die castings, which method has been used with very good success by a great many concerns throughout both the United States and Canada. For the benefit of those who were unable to read that article I give below the same formula with a few instructions regarding the use of the solution.



EXAMPLES OF DIE CAST PARTS OF PHONOGRAPH, NICKEL PLATED.

Water	1 gallon
Double nickel salts	8 ounces
Single nickel salts	2 ounces
Sal ammoniac	2 ounces
Magnesium sulphate	2 ounces
Boracic acid	1 ounce

A regular nickel anode should be used together with a high amperage and a dummy to protect the work from burning.

It will be found that in making die casting that there will not be two shipments alike, that is, containing the same composition unless a specific composition is demanded. There are so many compositions used in die

castings at the present time that it is hard to take any one of them as an illustration, but we will place them in two classes; first, those containing a high per centage of tin and second, those containing a high per centage of zinc. The die castings with the high amount of tin are very easy to plate in almost any nickel solution, providing proper care is used in the handling of them. There will be found a great deal of trouble in plating die castings that are made with a high zinc composition and in this article it is my intention to endeavor to assist in overcoming this difficulty once and for all.

During the past few years electric cleaners have been installed and used in so many shops that it is hard to find a good place without one. By the use of the electric cleaners in plating die castings we can do away with a great deal of scouring. While I have tried a number of the different formulas and prepared solutions and have had good results with all, I will not give any special formula for the cleaning solution. It is well to remember, however that it is not advisable to leave the castings in an electric cleaner, no matter what kind it is, more than a few minutes. If the articles are left in the cleaner any length of time a deposit of iron will appear on the surface which will cause peeling of the deposit later. Articles containing an amount of buffing dirt should be cleaned first with gasoline or benzine and then cleaned in the usual manner, after which they should be plated in the following solution which, owing to the density, must be kept warm. Otherwise if it becomes cold it will re-crystallize on the side of the tank and anodes.

Water	1 gallon
Double nickel salts	8 ounces
Single nickel salts	4 ounces
Sal ammoniac	2 ounces
Magnesium sulphate	4 ounces
Boracic acid	1 ounce

The solution is very high in metal and therefore will plate very fast. It will be found to give very successful results without the high amperage recommended for the first formula. Also it will not burn the work, thereby saving in both time and material. If another finish is desired it is very easy to rinse off the nickel solution and follow it up by plating the article in any other solution. Pure nickel anodes are the only kind that should be used for nickel solutions for plating die castings.

THE ALUMINUM INDUSTRY IN 1917

A Review of the Conditions Existing as to Supply and Demand of the Light Metal.

Written for The Metal Industry by Aluminum Man.

The conditions obtaining through the year 1916 continued through the first half of 1917, the demand somewhat exceeding the available supply. During the latter half of the year 1917 there occurred a substantial increase in the supply due to the completion of the large plant of the Aluminum Company of America at Badin, North Carolina, and there also occurred some curtailment of the private demand due to causes largely influenced by the war.

Probably the greatest single item of this curtailment was caused by the diminution in the output of pleasure automobiles on account of the automobile manufacturers taking on a large quantity of Government work. Diminution has also taken place in some other lines due to the same causes.

At the same time substantial increases have taken place in the demand for Government use so that with the increased producing capacity which has come into operation the actual demand during the latter part of the year approximately equalled the production.

In common with all other industries, aluminum manufacture has suffered somewhat from labor troubles throughout the year with necessity for a rising wage scale. Production has also been somewhat hampered by unusual droughts occurring in the South, causing temporary diminutions in the amount of available power, but the reductions of output due to these causes have not been serious in quantity and the total production has not been very far below the anticipated possible production. The most serious reductions of ouput have actually been caused by the difficulties of procuring sufficient labor, materials and transportation for the completion of new undertakings. These causes delayed until August the starting of the plant at Badin, which was expected to take place in January or February, and have so seriously delayed the completion of the large power project in the Little Tennessee River which was expected to be completed during the latter part of 1917, that this installation cannot go into service before the summer of 1918, and the aluminum output from power developed from this plant will consequently not be available until at least during the latter half of 1918.

A second large power development has been begun also on the Little Tennessee River in the same neighborhood as the first one, but with the existing difficulties in labor and transportation and the supply of necessary materials for construction, it is impossible at this time to say when this plant will become available.

At the close of the year it appears probable that the supply of aluminum will be sufficient for the demand during the year 1918 but the uncertainty as to the demand makes it impossible to make such a prediction with assurance. It appears probable that the demand for private uses will not increase much during the year excepting for material intended for the manufacture of war orders. The principal uncertainty lies in the amount of Government demands. The consumption of aluminum for the manufacture of ammonal still makes heavy drafts on the supply and next in order is probably aluminum for use in the construction of military motor vehicles. The demand for material for aeroplane manufacture has also become an important item, as has that for the manufacture of general military equipment. The amounts which will be required for these purposes are unknown as this is written, but it is certain that they will be large.

No substantial changes have taken place in the fabricating business during the year. The large sheet rolling mill at Edgewater, N. J., has been in operation throughout the year and has materially relieved the stringency in the available supply of aluminum sheet. The existing fabricating plants throughout the country have been in full operation for the entire year with some additions to capacity in some of them. As a whole the industry is meeting the requirements made upon it as well or perhaps better than any of the other metal industries.

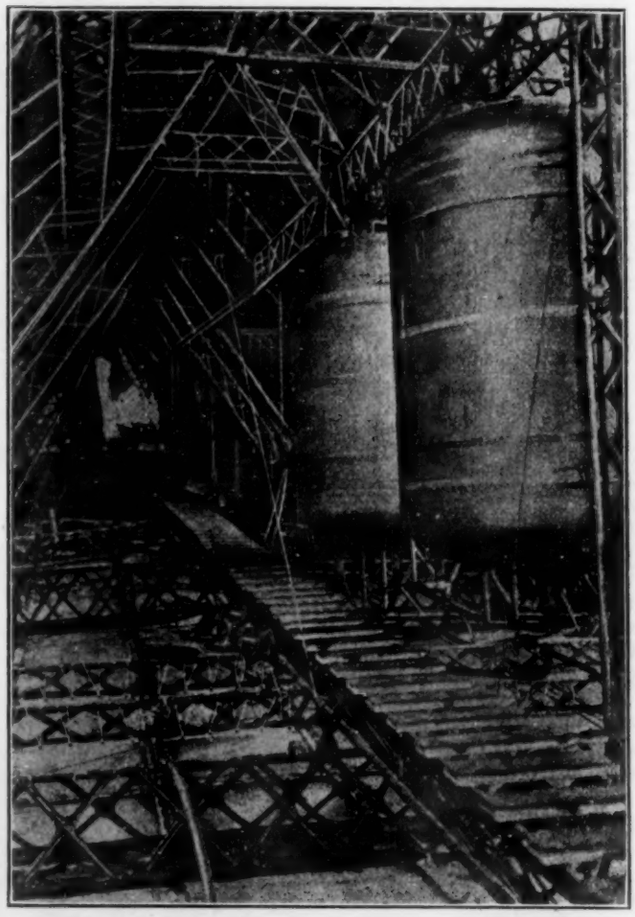
The principal producers of the metal have continued their policy, which has been in force since the beginning of war demands, of reserving for use in the United States the aluminum produced within the country, taking care of the foreign demand from foreign plants, excepting so far as the Allied Government requirements have compelled this policy to be infringed upon.

ALUMINUM IN AIRSHIP CONSTRUCTION

THE ZEPPELIN L 49 BROUGHT DOWN IN FRANCE GIVES AN OPPORTUNITY TO STUDY ITS MAKE-UP.

THE L-49 ZEPPELIN BROUGHT DOWN IN BOURBONNE LES-BAINS, FRANCE, IS 640 FEET LONG AND 90 FEET THROUGH.

Reports from American Field Headquarters in France describing the Zeppelin L-49, which was brought down near Bourbonne-les-Bains, gives the following facts: It is 600 feet long, with a diameter of 90 feet, has an aluminum frame, with longitudinal and horizontal ribs, covered with stout interlaced cord, over which is the outside cover of linen, painted



INTERIOR OF THE L-49. ALL OF THE FRAME WORK AND THE LARGE TANKS ARE MADE OF ALUMINUM.

black. The shape is that of an exaggerated fat cigar. Two silk balloons fill the interior, holding the hydrogen gas, which gives the lifting power. Slatted runways, nine inches wide, with guide rails, extend the length of the airship, giving access to sleeping quarters, an electric kitchen, and the five great steel engines. The Zeppelin's instrument for calculating altitude showed she had ascended to a height of 42,000 feet.

CHILL CASTING OF BEARING METALS

It might be considered that, if the best results are to be obtained by somewhat rapid cooling, by chill-casting one would arrive at the most perfect conditions. This is, however, not so. The effect of chilling is to cause the metal to solidify so quickly that the hard compounds crystallize very minutely throughout the mass, the grain of the structure being so minute the metal can be considered as more or less homogeneous. On the other hand, too slow cooling of bearing metal causes the separation of very large crystals of the hard compounds.

THE EVOLUTION OF A METAL SUNDAE HOLDER

An Article Dealing With Mechanical Operations on Nickel Silver.

Written for The Metal Industry by A. F. Saunders, Designer Benedict Manufacturing Company.

The wave of temperance which is slowly but surely spreading over our country has been a big factor in increasing the popularity of all kinds of liquid and frozen refreshments served at the soda fountain; the demand for something new and tasty has kept the soda dispenser almost at his wits ends to devise new dainties to tickle the palate of a thirsty public.

This all means an increased demand for better service both as to practical methods of dispensing and attractiveness of the various containers used in serving, in consequence the manufacture of all kinds of soda fountain accessories made of metal has developed into a very large and really important branch of the metal industry.

The up to date proprietor has been quick to recognize the importance and practical value of attractive fountain accessories; that sight is as much an aid to appetite as taste, is an undisputed fact.

Soda or ice cream served in an unattractive container surely does not promote a desire for a second portion, whereas a handsome, dainty container or holder passed over a clean counter or served in a sanitary manner on a clean table means delicious satisfaction and a steady customer.

SILVER PLATED "SUNDAE" HOLDERS.

Of the various articles used in the serving of ice cream at the soda fountain the silver sundae holder is paramount, it is easy to keep clean, practically indestructible, and far more attractive in appearance than either china or glass.

With the great variety of tastefully designed and substantially made articles of this character on the market today, there is really no excuse for any fountain having a poor looking service, which simply detracts from the fine appearance of a perhaps otherwise attractive establishment.

A little tour of investigation into the details of manufacture of soda fountain accessories as being used daily by the thousands of soda and ice cream dispensers throughout the country, may prove of interest to the readers of The Metal Industry.

We will attempt to explain the evolution of a silver plated sundae holder, showing its gradual development through the numerous stages of operation from the original design to the finished product ready for its mission of service.

Beginning with the design, three important factors must be considered in its conception: strength in construction, practical to handle, and of graceful proportions; one is as necessary as the other if the article is to properly fulfill its purpose. If strongly and honestly constructed of the best materials, it will withstand the exceptionally hard service all such articles are naturally subjected to; if designed with the practical side in mind it should be convenient to handle and easy to clean, free from all unnecessary embellishments if for no other reason than a sanitary one. Any article used about a soda fountain should be of the plainest form, dirt catching ornaments have no place here and an article can be made to appear beautiful through graceful outlines alone.

18% nickel silver has proven itself by years of service to be the very best metal possible to use as a base metal, it is naturally tough, possessing a high degree of tensile strength and almost as white in color as silver, possessing a natural affinity for silver; thus a condition of perfect adherence is assured when plated. The value of a heavy silver plate is two-fold, first, because of its non-corrosive qualities, thereby being more sanitary than most other metals, secondly, because of the beauty in color of the metal and its susceptibility to a fine finish.

Now for the mechanical operation necessary to produce a sundae holder such as illustrated in this article.

1st operation, rolling into sheets.

Starting with the heavy cast ingot of nickel silver, which is passed through large steel rolls back and forth under varying pressure until the required gauge or thickness is obtained.*

2nd operation, blanking.

After annealing, the sheets are ready for the blanking or cutting up into circular disks of just the right size to allow for forming up the body and the base of the cup.

3rd operation, drawing up or forming.

The blanks for the forming of the body of the cup now pass through a set of hardened steel drawing dies which draw up the metal to the height and shape of the cup, the particular cup illustrated requiring two draws, with an annealing after the first draw. The foot or base undergo practically the same operation, excepting that a third operation is necessary to cut off and roll under the very bottom edge.

4th operation, sand buffing.

The drawn shells are now ready for the buffing or smoothing up of the surface. This operation is done with automatic buffing machines which do this work very quickly and in a more uniform manner than by the old hand process. From the sand buffing the shells pass into the assembling department. If the final finish, however, is to be burnished or bright polished, the shells require grease buffing as well as sand buffing that they may have a perfect surface.

5th operation, assembling.

Here the body and base shells are silver soldered to a solid cast pillar or stem and we have the holder ready for the plating. Great care must be exercised in the soldering as the strength and durability of the article depends upon a perfect union of the several parts. From the assembling bench the complete cup or holder passes into the plating bath, after a preparatory cleansing in an electric cleaning solution; an absolutely clean surface is, of course, necessary for perfect plating.

6th operation, silver plating.

Upon this important operation depends, next to the

*Rolling of Nickel Silver, The Metal Industry, June and August, 1915.

actual strength of construction, the real wearing qualities of the article, the heavier the deposit of silver the longer the life of the holder. It is here that the reputation and honesty of the manufacturer counts, as one can not judge the amount of silver plate by appearance alone. One-half a pennyweight of silver looks just as good as five times that amount after the final finish is given, but it means a vast difference in the wearing qualities of an article that is in constant use.

7TH OPERATION, FINISHING.

The final operations are the brushing, polishing, or burnishing, whichever finish is desired. The semi-dull finish obtained by brushing down with fine pumice is perhaps the most serviceable, and is commonly known as butler. When a particularly handsome effect is desired, however, nothing quite takes the place of a high polish obtained either by burnishing or rouge buffing. This is, of course, more costly but is the very acme of fine finish.

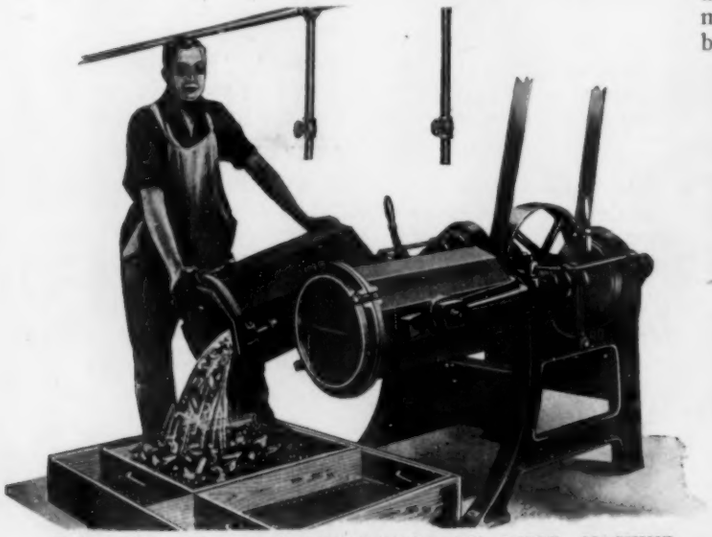
STEEL BALL POLISHING AND BURNISHING

SOME PRACTICAL SUGGESTIONS FOR THE FINISHING OF METAL ARTICLES

WRITTEN FOR THE METAL INDUSTRY BY T. C. EICHSTAEDT.

There is much to be said on the subject of steel ball polishing and burnishing though it is impossible to give al the information as there are as many different methods used that are practical as there are different kinds of articles manufactured. As each individual manufacturer's needs are different and as each man in charge of the finishing departments has his own ideas, each one seems to have worked out a process of his own. Still there are a great number who are not using this method of finishing work that could be so finished with a large saving.

The steel ball process is not a new process, neither is it an old one and can still be developed wonderfully.



POLISHING BARREL MANUFACTURED BY BAIRD MACHINE COMPANY, BRIDGEPORT, CONN.

I have had some experience with this process and will endeavor to give some of it for the benefit of those who may desire to experiment along these lines. In an article in THE METAL INDUSTRY for August, 1917, I covered the matter of the tumbling barrel polishing process.

It will be surprising to many readers to know how much work can be finished by steel ball polishing and burnishing and how much labor can be saved, in finishing such work as brass and bronze castings of irregular shapes without sharp corners, as, for instance, window fasteners, draw pulls, window lifts, coat and hat hooks, knobs, cubbard fasteners, novelties of all kinds and shapes, automobile trimmings, and also brass, bronze and copper stampings. Of course the smaller the pieces the more can be put into the barrel at one time. Then there are aluminum castings such as knobs, door handles and numerous different articles, also steel stampings, forgings, malleable iron and cast iron, and in fact any metal article.

The burnishing by the steel balls does not polish off the corners and edges of the articles as does the tumbling with sand and grit or other methods as mentioned in previous articles.

FINISHING OF BRASS CASTINGS.

I will try and take each metal by itself and explain as nearly as possible just how the different operations are accomplished. For the first we will take articles made of brass, which is a metal that it is understood by some cannot be successfully tumbled and thus elimin-

POLISHING BARREL MADE BY H. J. ASTLE COMPANY, PROVIDENCE, R. I.

ate the polishing and buffing altogether. But I have seen it done successfully and have also done quite a bit of it myself.

There are many different shapes of tumbling barrels, the octagon, the round, the tilting and the oblong and egg shapes. All of these barrels are good and each is adapted to special kinds of work, but for general use I have found the open-top, tilting barrel the most adaptable. There are also different opinions as to whether an iron or wooden barrel is the best. Some claim that an iron barrel that is lined with wood should be used for brass work, while others say that a brass-lined iron barrel should be used, and still others say the wooden barrel. Then there are also different sizes of barrels. I have found that a small barrel is the

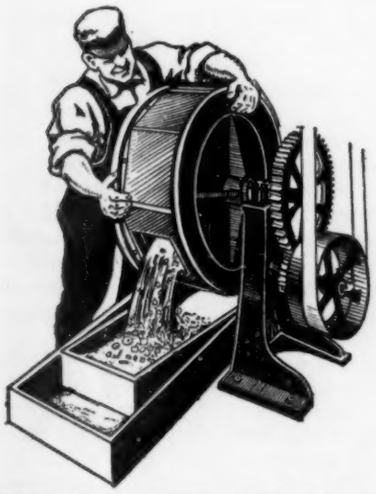
most successful for small brass castings even where there is a large quantity of brass castings to burnish, as it seems that they do not finish as quickly nor as bright in a large barrel. A barrel about the size of a nail keg or a quarter barrel, but not a real small keg.

The speed of the barrel also has a great deal to do with the time of finishing and also the brightness of the finish. The castings should not tumble but should roll and the proper speed is from 50 to 60 revolutions. Anything over 60 is too fast and under 50 is too slow. The load that is put into the barrel should also be considered. In a tilting open-top barrel, of course, it can be loaded as light or as heavy as is desired, as it can be tilted at different angles, according to the amount of articles in the barrel. In a closed barrel, however, the load should be at least seven-eighths full. The amount of work and amount of balls should also be about equal, but this, of course, should be judged according to the kind and size of work being finished. If there are holes in the work, it should be taken into consideration so the balls must not be of such a size that they will wedge into the holes and stay there. Still if the holes are threaded the balls should not be small enough to roll into the threaded holes, as they will wear the threads.

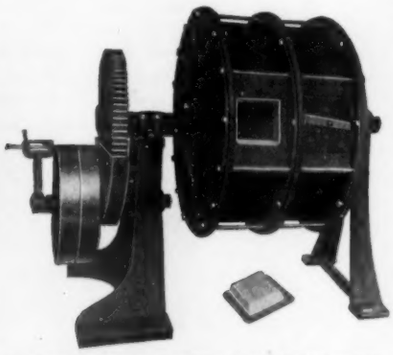
Brass castings should be first tumbled in water and sand or some kind of grit for from 6 to 12 hours before burnishing with steel balls. There are also steel rollers pointed at either end that are very successfully used in different size from ⅛ inch diameter by ¼ inch long to any size desired and best adapted to the kind of work to be finished. The length of time for the brass castings to be burnished with balls, after having been tumbled for the above mentioned time in sand and water with a little potash, should be anywhere from 3 to 5 hours or longer if desired. However, if conditions are right five hours should be sufficient.

The solution used has a great deal to do with the brightness of the color on the burnished brass. Some use soda, potash, cyanide or almost any kind of cleaning compound or soap chips. There are soap chips on the market for that purpose that work with good satisfaction, but I have found that the best solution is a little thick lopered milk, say about 1 pint to a small tumbling barrel. The barrel should be filled, as mentioned above, about seven-eighths full of work and the balls should be about 50 per cent. by bulk of the work and then the barrel filled with water and the pint of milk. The barrel is then closed tight and started. After the barrel has run for 3 to 5 hours it should be stopped and opened, and the work examined. Care must be taken in opening the barrel, for if it is opened suddenly there will be a splash of suds which will fly in all directions. The best method is to have a plug in the lid and the plug can then be removed before the lid is taken off and the air allowed to escape.

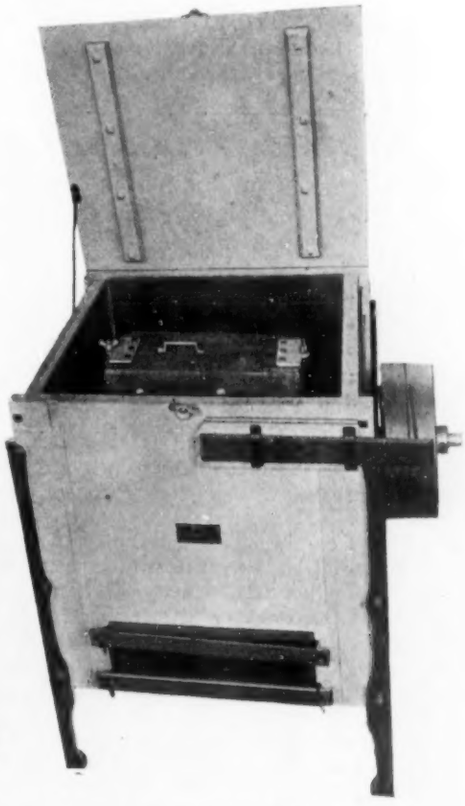
I find that the steel barrel is the best for general use for brass, steel or iron work and I have finished work in such a barrel that would take an expert to determine that it had not been buffed.



BURNISHING BARREL MADE BY ABBOTT BALL COMPANY, HARTFORD, CONN.



A DOUBLE COMPARTMENT BURNISHING BARREL, GLOBE MACHINE AND STAMPING COMPANY, CLEVELAND, OHIO.



TWIN BARREL OCTAGON MACHINE, SMITH RICHARDSON COMPANY, ATTLEBORO, MASS.

For quick handling of the work after being burnished a screen should be used containing holes large enough for the balls to pass through and in this way the work and balls are separated. In order to keep the balls from rusting they should be kept in a solution of soda water. The tilting barrel is much easier to use on account of the method of emptying it and the work can be examined without stopping or opening the barrel, as it is always open and some of the work can be taken out at any time. This style barrel is only for general use and when there is a lot of work to be burnished the best barrel adapted to that kind of work should be taken into consideration and after experimenting the proper choice can readily be made.

Brass stampings can be burnished with the same solution and steel balls as the castings, but do not need the grit tumbling. Brass screws, bolts or nuts that have been machined can also be burnished the same as the stampings, the length of the time required for burnishing depending on the size of the work and the condition of the machining.

FINISHING STEEL FORGINGS.

A great saving in the polishing or burnishing of steel forgings such as wrenches and pliers can be made by the use of this process. After the forgings have been trimmed they should be polished or ground just enough to take off the fins or burrs. They should then be put into the barrel after first having been hardened and pickled in order to take off the scale caused by the hardening process. The barrel should be filled up until seven-eighths full, about half of balls and half of the work, then filled with water and a strong solution of caustic soda or potash. I would suggest using two pounds of caustic soda or potash to a large barrel. The best type of barrel for this kind of work is a cylinder barrel made of steel. One that opens on the end and which can be dumped out by tipping the barrel. The work or forgings are run for 1½ hours to 3 hours, depending upon the condition of the forgings. The common automobile pliers can be finished more cheaply by this process and can then be nickel plated. They will look better and will command a better price when put out with this finish than when given the blue finish. There are a great many other forgings that can be finished in this way.

There are some so-called patented tumbling barrel burnishing processes on the market and quite a few tumbling barrel manufacturers have processes which they will gladly furnish details of upon application, but those desiring to go into this kind of work would save a great deal of time and expense if they would get some one who has had the experience and who can give them the information. The harness hardware manufacturers can use this process and a great many of them are now doing so.

THE USE OF SODIUM SULPHO-CYANIDE IN BLACK NICKEL SOLUTIONS

DIRECTIONS FOR THE USE OF THE MATERIAL FOR REPLACING AMMONIUM OR POTASSIUM SALTS PREVIOUSLY USED IN BLACK NICKEL SOLUTIONS.

WRITTEN FOR THE METAL INDUSTRY BY CHARLES H. PROCTOR.

The extreme shortage in many lines of the chemical industry and the inability of obtaining materials for many chemical products formerly made in this country or imported has led American manufacturers to replace these materials with similar products which have been found, in most cases, to give identically the same results.

The introduction of the black nickel solution to the plating trade occurred many years ago and the writer's first experiment with such a solution was about thirty years ago. This solution was prepared from double nickel salts on the basis of 8 ounces per gallon of water and the solution was afterwards cleared with fused cyanide of potassium, which was the material in use at that time. A concentrated solution was prepared by dissolving the fused cyanide of potassium in hot water and then adding all the arsenious acid the concentrated solution would absorb. The arsenic solution was then added to the nickel and cyanide solution in small proportions until a good uniform black color was produced. The writer has still in his possession articles made of brass which were finished in black nickel from such a solution over twenty-five years ago and which are now in good condition.

Dr. Oliver P. Watts in his address before the American Electro-Platers' Society two years ago on Black Nickel Solutions spoke on the black nickel solution mentioned in an article by the writer published in 1904 as being the first authentic reference to black nickel solutions that had been made. A few of these types of solutions are still in use.

Later the nickel sulpho-cyanide solutions appeared in the plating industry but the originator of this type of solution is, as far as the writer's knowledge goes, unknown. The solutions of this kind were prepared from double nickel salts, zinc sulphate and potassium sulpho-cyanide, which evidently produced a black deposit of nickel sulphite with some zinc sulphide in it. For successful results the voltage used for still solutions was not to exceed one-half volt, otherwise the deposit came out a grayish black due to the fact that the nickel and zinc was deposited too rapidly. Such a solution gave excellent results in barrel plating, especially when benzoic acid was added in small amounts to the solution. A solution of this type has been used for several years by a large firm manufacturing safety pins, and similar materials.

If the deposits from the black nickel solution had a brownish black tone, immersion in a solution of one to five per cent. perchloride of iron and water removed the brownish tone and produced a more intensely black finish.

Eventually ammonium sulpho-cyanide was used in the place of the potassium salt as many platers claimed that more uniform results could be obtained with this salt, but finally this material was practically all absorbed, the market became depleted and very high prices prevailed for the very little salt that was still to be had through local chemical houses. It is only within the past two weeks that sodium sulpho-cyanide has been put on the market and the material is now selling for $1.25 per pound against three to five dollars for what little ammonium salt there is still to be found.

A test was recently made by the writer at the plant of a well known job plating concern with the new material. Excellent results were obtained and in the writer's opinion no material difference was noted in the deposit than when the potassium or ammonium salt was used. A good uniform black coating was obtained in ten to fifteen minutes at one-half volt pressure.

The test solution was prepared upon the following basis:

No. 1	Water	1 gallon
	Double nickel salts	6 ounces
	Single nickel salts	2 ounces
	Ammonium chloride	1 ounce
No. 2	Zinc sulphate	1 ounce
	Sodium sulpho-cyanide	2 ounces

The solution was made up by dissolving the nickel salts in as little boiling water as possible for the solution, adding the balance of the water cold except about 1 pint, which was heated and the zinc and sodium sulpho-cyanide dissolved separately. The two solutions were then mixed thoroughly and the regular cast nickel anodes were used. Immediate results were obtained after the solution had become electrolized.

The writer is sure that the plating industry, especially concerns employing black nickel solutions, will be gratified to know that a substitute for the ammonium and potassium sulpho-cyanide has been found in the sodium salt.

SILVER PLATING AND OXIDIZING ADVERTISING JEWELRY AND NOVELTIES

Written for The Metal Industry by E. J. Beaudry.

With the high cost of brass and copper the manufacturer went to work and made the most of his goods out of cold rolled steel, so you will agree with me, Mr. Plater, that the electroplating of steel novelties is more difficult to handle than if they were made of brass. So I will try and tell you my experience of silver plating and oxiding steel novelties such as watch fobs, putty knife handles, scarf pins, etc. I take fobs which come in 10,000 lots and have them wired 7 on a wire, 700 fobs fill my plating bath, this amount I make in 4 bunches, 25 wires in a bunch, these fobs have been annealed in the press room and this leaves them with quite a scale on them which I have to remove before plating, so I take them and boil them out in a muriatic pickle for about 15 minutes.

Pickle composed of

Water ..... 4 gal.
Muriatic acid ..... 4 gal.

Use cold

Then they are rinsed in cold water and then in an acid dip that is being used for steel work only.

Acid Dip

Sulphuric acid .... 2 parts
Nitric acid ..... 1 part
Muriatic acid .... 1 oz. to every 5 gal.

From the acid dip into cold water and then in a cyanide solution.

Sodium cyanide ..... 4 oz.
Water ..... 1 gal.

I take them from the cyanide dip into the cold water and then into nickel plating bath, I run them in this bath for 30 minutes on high current.

Nickel Solution (per gal.)

Double sulphate of nickel. 8 oz.
Single sulphate of nickel.. 4 oz.
Boracic acid .....16 oz. to 300 gal.
Ammonium sulphate ....¼ oz. each gal.

Then I take 25 wires out of the nickel bath at a time and hang them in the silver strike solution for about 3 minutes.

Silver Strike

Sodium cyanide ..... 15 oz.
Silver cyanide ..... 1 oz.
Water ..... 1 gal.

Use cold rolled steel annodes

They are then put in the silver plating bath for 25 minutes, then they are ready for oxidizing.

Silver Solution (per gal.)

Silver cyanide ..... 3 oz.
Sodium cyanide ..... 9 oz.
Water ..... 1 gal.

Use Silver anodes

The oxidize I use is a substitute of liver of sulphur. It gives me good results on this line of goods.

Potassa sulphurette, substitute 3 oz.
Water, 1 gal.
Use hot

After oxidizing I dry them out in sawdust and they are then relieved on the wires with a soft muslin buff with pumice and water. Great care must be taken during this operation so as not to leave these articles stand in water any length of time because they are liable to rust, so the best method I found to avoid this is to put three men on relieving these articles at the same time, as fast as these three men finish a wire of these fobs, I have a boy take them and rinse them in cold water and then in boiling hot water, dried in sawdust, and lacquered in a transparent lacquer, dried in an oven of about 85 degrees and then they are ready for inspection.

The reader will notice I used steel anodes for my silver strike solution. I used silver anodes for 5 days. The result was with an output of 5,000 fobs per day. I was formerly using 12 oz. silver off my anodes each day in my strike and silver baths, and now by using steel anodes in my silver strike solution, I use with the same output of work on an average of 9 oz. of silver each day, which I have been doing for about 3 years, so you see by using steel anodes in the silver strike I save 3 oz. of silver each day, and I have good results from them. They will not corrode and you certainly do not deposit steel in a cyanide solution. It is only a short time ago I got 50,000 scarf pins to silver plate and oxidize finish. Competition was so close there was not a chance for me to wire these pins nor put any great amount of time, or silver on them, so I made a basket of brass mesh about 22 in. long, 10 in. wide, 3 in. deep. These pins had a brass stem and steel head, so I took 600 in a dipping crock at a time and cleaned them as I did the watch fobs, as stated above. It took just 4 of these crocks of 600 pins to fill my brass basket which made 2,400 pins. I took them and put them in the nickel bath for 35 minutes on high voltage, say 6 volts, then I rinsed them in cold water, and then in a silver bath I have for such purpose. This silver bath is made up of silver nitrate which I get from the silver strip used for taking fire out of sterling silver pins, finger rings, fobs, etc. Solution is made up as follows:

Silver nitrate ..... 2½ oz.
Sodium cyanide .....12 oz.
Water ..... 1 gal.

I use steel anodes 2 ft. long 1 ft. wide. I keep the basket in motion for about 20 minutes on high voltage, then they are ready for oxidizing, relieved with a soft buff and pumice, dried in sawdust and lacquered in baskets. The basket I use for silver plating these pins becomes heavily coated with silver after doing 50,000 of these pins, so I take the basket and cut it up in small pieces and dissolve them in a solution of nitric acid and water, say 3 parts nitric acid, 1 part water. When all dissolved I make up a solution of salt and water, say 3 lbs. salt to 1 gallon of water. I place the acid solution with metal that has been dissolved into a 10 gallon crock, then add the salt solution to the acid solution. This operation will throw whatever silver there is in the acid solution to the bottom of the crock, and it will leave all other metals afloat on top which has formed into a green colored solution. Then fill the crock with clean cold water and let it stand for about 1 hour. Then syphon all the water in the crock down to the white sediment on the bottom which is silver nitrate. Do this operation four or five times until litmus paper tells you the acid is all washed out, and you have at the bottom of the crock chloride silver. I figured I had 12 oz. of chloride silver from the basket I cut up. Then take 36 oz. of sodium cyanide and dissolve in hot water, and add to the chloride of silver which makes you a silver cyanide. By filtering this solution through three or four thicknesses of fine cheese cloth it is ready to put back in your silver solution and you will find it will act as a fine replenisher.

WATERBURY, CONN., PRESERVES LANDMARK

THE SPOT WHERE THE FIRST BRASS KETTLES IN THE UNITED STATES WERE MADE IS KEPT AS A PUBLIC PARK.

Waterbury, Conn., has added to her public park system a considerable portion of ground in what used to be the "East End" of the city before its present extensive development began, and this includes the historic site of the first mill which turned out brass kettles in this part of the country. Away back in the days when brass kettles were first attracting the attention of African kings and when they were used to purchase what the traders wanted from those kings the best and most desirable were produced in the little plant which the American Brass Company purchased some years ago, and which is now but a deserted relic of early New England industrial enterprise. The buildings are to be preserved and every effort will be made to keep the remains of the old water wheels protected against the hardships of weather and the wear of time when plans for the development of this new portion of the city's largest park are completed. The land was donated to Waterbury by the American Brass Company, and adjoins a tract donated also by the Scovill Manufacturing Company.

THE "OLD MILL," WHERE THE FIRST BRASS KETTLES WERE MADE IN WATERBURY, CONN.

THE WATER WHEELS WHICH RAN THE "OLD MILL."

EDITORIAL

Vol. 16 New York, January, 1918 No. 1

THE METAL INDUSTRY

With Which Are Incorporated
THE ALUMINUM WORLD, COPPER AND BRASS, THE BRASS FOUNDER AND FINISHER, THE ELECTRO-PLATERS' REVIEW.
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CONTENTS

FIFTEEN YEARS

In mentioning the Fifteenth Anniversary of the founding of THE METAL INDUSTRY, we have the pleasure of issuing to our subscribers and advertisers a 168 page publication replete with the latest and best shop practice, the latest news and the newest and best equipment.

The principal articles are written by the leading authorities on their respective subjects, and they describe the different branches of the metallurgic art in the various metals and alloys to which THE METAL INDUSTRY relates, viz: brass, copper, tin, lead, zinc, aluminum, nickel, silver, gold, bronze.

There are also several articles of timely interest on new industries, old industries and the war, and referring to the war, we have started in this issue an honor page containing the portraits and positions of metal men who are serving their country in the Allied cause of liberty, righteousness and justice.

Besides our regular reviews, which are published each year in our Annual Review number, we have added permanently two pages which are to quote metal, supply and and stock prices, and which we believe will prove to be valuable commercial information.

A year ago THE METAL INDUSTRY announced that we had made application for membership in the Audit Bureau of Circulations, and the examination by that Bureau has taken place during the year, and the result placed before our advertisers.

Though we had never exaggerated the circulation of THE METAL INDUSTRY and had given our advertisers every proof within our power of the total distribution that we claimed, we joined the Audit Bureau that our advertisers might have a report from a disinterested outside board of examiners, who make a strict and thorough examination of a publication's output. By this procedure the advertiser learns exactly the number and the location of a journal's distribution, as found by the inspectors of the Audit Bureau.

If the advertiser does not have such a statement of circulation from a recognized examining board as the Audit Bureau, the advertiser is liable to be in the dark, so to speak, as to what his advertising is costing him per copy distributed. If he did know he might be astonished at the high rate per copy he is paying in an apparent attempt to reach certain fields.

In this respect THE METAL INDUSTRY has turned on the light, and our advertisers now have a guarantee of circulation, both quality and quantity, that cannot be disputed.

During the past year we have perfected some of the systems we have of supplying information to our readers and advertisers, and can promise a continuance of this improved service. In short a larger, better and more interesting paper—one that completely covers the field of the metal and plating interests.

RETROSPECTIVE REVIEW OF 1917 — OUTLOOK FOR 1918

The year 1917 will stand out in the history of the United States as one of most momentous happenings. In April this country entered the great world war. Following the declaration of Congress that a state of war existed between the people of the United States and the German Government things happened thick and fast. First in order came the selective draft law by means of which nearly ten million men between the ages of 21 and 31 were obliged to register for military service. The administration at Washington organized all kinds of advisory boards to aid in the carrying on of the gigantic preparations necessary for the prosecution of the war. The financial and industrial resources of the country have been mobilized and just recently the railroads have been taken over. Two Liberty Loans have been successfully carried out, raising something over five billions of dollars for the war expenses. The Red Cross has had two successful drives, one for one hundred millions of dollars and the other for ten million members. Taking it all in all 1917 has seen plans evolved and put into execution such as would not have been believed possible two or three years ago. The "Rainbow Division," comprising troops from every State in the Union, has been mobilized and sent abroad without the loss of a man. A vast number of hospital units, including doctors, nurses, orderlies and ambulance drivers have been organized and a large number have gone to the other side. This last year can be very properly termed America's great year of preparation and the early part of 1918 will find the United States ready to take her place with the Allies and carry on the greatest war of history; to make the world safe for future generations.

THE METALS IN 1917.

The metals in 1917 have occupied the principal place of interest to manufacturers as they did in 1916. The metal chart, which we publish in this issue of THE METAL INDUSTRY, still shows sky rocket rises in prices, particularly in the case of tin, silver and platinum. Copper, of course, is the metal most in demand and commands perhaps the most attention as it is the most important of war material next to steel. In fact the Germans have found it so necessary to get copper that it is reported they have collected all the bronze statues and memorial tablets to be found in the captured countries and shipped them back to Germany to be remelted for use in cannons and munitions. The Government price of 23½ cents placed upon copper during the summer had the effect of halting a great deal of business in which the metal played an important part. This is proven by the fact that the large producers report that they have not booked orders very far ahead. The fact that the present agreement with the Government terminates February 1, 1918, is a dominant factor in the situation.

So far as the demand for copper is concerned the situation could not be better. The mining companies will have a sure outlet for all they are likely to produce for the period of the war. As to copper after the war, it is, of course, difficult to predict, but in our own opinion it is clear that many enterprises of large importance are being deferred and that going industries are being driven to capacity regardless of up-keep and that as a consequence there will then be a demand for construction and restoration to take care of a large volume of business now held up which will be let loose. If in this country restoration is necessary because of known conditions here, there should be no doubt as to restoration and reconstruction in Europe, with the known industrial conditions in the Allied countries and the unkown but probable industrial conditions in Germany and Austria.

This whole situation must be reversed as soon as possible after peace is declared so as to get the needed metal in transit. This means that large quantities of copper must be bought and transported to Europe fully two months before it is in hand for use in European mills, and this represents in itself a large tonnage in transit. Then there is the stocking up of the mills to work advantageously and economically which will require a tonnage in connection with the quantity normally in transit of many millions of pounds. This tonnage might be estimated at from 200,000,000 to 300,000,000 pounds. From all points of view, excepting as to price for the war period, the copper industry may well be satisfied and after the war, with the market restored to a normal basis of supply and demand, the price realized ought to be relatively much more satisfactory from the standpoint of net profit than it is at the present time.

SILVER.

The rapid rise in the price of silver during 1917 from around fifty cents per ounce to $1.08 caused both the British and United States governments to confer as to the best methods to stop wild speculation and protect coinage interests. No definite conclusions have been reached but it is understood that a price of $1.00 will be fixed. The immediate effect of this will be to stimulate the production of silver from small properties, and of those metal properties where silver is a by-product in order to meet the demand occasioned by the disappearance of gold.

TIN.

Tin has shared in the prosperity of the other metals, having touched a high point of 86 cents per pound. The reasons for this are, of course, the wide demand for the metal for use in tin-plate and the fact that no tin of any amount is mined in the United States. A review of the tin market for the year as well as of other metals is given in The Metal Market Review for 1917, publishd in this issue of The Metal Industry.

AMONG THE MILLS IN 1917.

Perhaps the most important event occurring in 1917

among the metal mills was the passing in July of the Buffalo Brass and Copper Company at Buffalo, N. Y., into the control of the American Brass Company. This mill started in 1908—had grown during 1916 to a wonderful state of development. At the time of its purchase by the American Brass Company at a price reported to be between $2,000,000 and $3,000,000 it had over 1,000 fires in operation and employed around 5,000 hands. It had completed contracts for many million pounds of munition brass and had acquired the Bridgeport Crucible Company to ensure its supply of crucibles to melt its metal in.

During the past year the Cleveland Brass and Copper Mills, Inc., Cleveland, Ohio, completed its plant and has joined the ranks of producing mills. This mill is destined to take its place among the well-known brass mills of the country and being located in the middle west should enjoy peculiar advantages over its eastern rivals. A full description of this mill is given in this issue of THE METAL INDUSTRY.

In October, 1917, the Bridgeport Projectile Company's plant at Bridgeport, Conn., was taken over by the Liberty Ordnance Company of New York. This plant was started at the beginning of the war by German capital to make munitions for Germany. When it was completed in April, 1915, it began work on a $5,000,000 contract for shells for the German government, $2,000,000 being advanced to the company through Carl Heyman, the Kaiser's representative. Heyman severed his connection when Count von Bernstorff was sent back to Germany. The Liberty Ordnance Company has now received a contract for 12,000,000 shells and 300 naval guns.

During the past two months the Connecticut Brass Corporation, West Cheshire, Conn., formed last year by J. E. Liggett, of Liggett and Drexel, has become merged with the Pilling Brass Company of Waterbury, Conn. The new company has the title of the Connecticut Brass and Manufacturing Corporation. The corporation is capitalized with $600,000 eight per cent. first preferred stock, $400,000 eight per cent. second preferred stock, both $100 par value and $2,000,000 in common stock of $10 par value. The plant at West Cheshire manufactures heavy coarse brass, while that at Waterbury makes thin rolled metal. The two plants have a combined melting capacity of 2,500,000 pounds of finished brass per month.

Another rolling mill to be established in 1918 which can be credited to 1917 for its inception is that of the American Zinc Products Company of Warren, Ohio. This company is capitalized at $1,000,000 and contemplates the installing of ten pairs of rolls to roll sheet and strip zinc. The officers of the new concern are D. W. Kerr, president and treasurer and R. A. Leitch, secretary.

During the year 1917 the New Jersey Zinc Company at their plant at Palmerton, Pa., have started the rolling of zinc sheet and strip. This mill is under the supervision of R. A. Wood the well known Mass. mill expert and author of the work WATERBURY BOOK OF ALLOYS.

OUTLOOK FOR 1918.

From a business standpoint the outlook for 1918 does not differ materially than it did for 1917. The main thing that will occupy the mind and hands of the United States during the coming year will be the prosecution of the war. This must and will be carried on to a finish if the aims of this country and those of the Allies as recently set forth by President Wilson and Premier Lloyd George are to be realized. The lesson of the Russian Bolsheviki and the German Autocracy peace fiasco will teach us if we had not learned before that Germany is out for annexation indemnity, conquest and everything else that she thinks she may want. The real danger of Germany's peace proposal to Russia lay in the fact that before it was translated into specific demands it had the appearance of a reasonable and honorable peace move. With the exposure, the German case with the Allied public collapse. It is certain that not even the Socialists or Labor elements have any desire to make a peace on German terms that would add 20,000,000 people to the subject races of Europe or put Russia's economic future at the mercy of Germany.

Knowing all this, then there is nothing to do but to prosecute the war with all our might and main. To this end the attention of the country will shortly be taken up by the third Liberty Loan which it is believed will be started about March 1, 1918.

We have got to get behind the Government which is devoting its entire energies to waging a great warfare for freedom. This warfare requires putting men in the field and keeping them fed and clothed. It requires the production of ships, and shells, guns and rifles, motor trucks, horses, saddlery, aeroplanes, hospital supplies, food and a great variety of goods the production of which calls for vast industrial plants from one end of the country to the other, manned by millions of men and women who serve their country as effectively as our soldiers and sailors.

If the American people continue to require all the pleasant and comfortable luxuries which they consumed before the war they are making it necessary for those thousands of factories and shops, employing millions of men and women, to produce articles which do not help to bring peace a day nearer, when they might be devoting themselves to the production of the necessary things which will help to bring the war to a victorious conclusion.

Both things cannot go on together. We have pledged the honor of our country and our people to fight this war to our last dollar and to our last man, if necessary. America does not break her word. The necessities of the war must be produced and must be produced quickly. The key to the situation, therefore, rests in the hand of the average man, woman and child in every State in the Union who can, by refraining from everything not absolutely necessary to health and efficiency, release strong arms to the production of materials of war and the support of our army and navy.

CORRESPONDENCE AND DISCUSSION

WE CORDIALLY INVITE CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY

WRITING ARTICLES FOR THE TRADE PAPERS—DOES IT PAY?

To the Editor of The Metal Industry:

Twenty years' experience as a free lance writer for various trade publications has at last convinced the writer that as a paying proposition, as measured in dollars and cents, it is a flat failure. The amount of study, research and experience necessary to equip those ambitious to shine as disseminators of knowledge and panderers to those seeking same at the least possible expense to themselves, is in inverse proportion to the financial benefits derived therefrom.

Perhaps the idealist will say that the satisfaction derived from the praise or abuse that such writings bring forth from persons who are supposed to benefit, is sufficient reward for the labor entailed. Possibly there is something in this claim, but as glory of itself has not as yet bought any Liberty Bonds it is a pretty safe guess that over ninety-nine per cent. of the writers who have been fortunate enough to receive checks for their writings, have not made a practice of returning same to the publishers unless they are marked No Good, Account Overdrawn or No Account.

As a means of livelihood the publishing of a trade paper is apt to be a precarious one, particularly for the first few years, and the number of those who have died almost before they were born is legion. Those who have survived and are now successful publications, are very apt to forget that their success was, in a measure, due to the writings of their contributors, judging by the meagre space rates they are paying to scribes at the present day. There are ways, however, of separating these close-fisted publishers from their money and in enlightening those who aspire to be ever present in the public eye as dispensers of wisdom, I do it from a sense of justice to these writers who have designs on the publishers' treasuries.

If you are handy at making sketches, by all means intersperse your articles with plenty of them, the more the merrier, as it does not make any difference to the readers, but it does make a big difference to the size of your check. Most editors have not the time to question the accuracy of the sketches submitted, while many of them could not tell a sketch from anything else and also could not detect a mistake. Do not think, however, that by making sketches or drawings to full size scale that the editors will fall for your desire to fill pages with them, as they have wonderful methods of reducing them to such infinitesimal proportions that it will be necessary to use a microscope to decipher the lines and the amount of your check.

Write on one side of the paper only, and use lots and lots of language, but do not tell all you know on the subject as you will need a reserve for the smart reader who is just laying for a chance to tell the readers how little you know. Then again the editor may know his business and in an editorial footnote make mean and sarcastic comments on your efforts as a writer, and you always want to have "a stone up your sleeve," so to speak, to come back at him with. However, be careful of your "come-back" and use as little space as possible as editors do not always pay for "come-backs." Do not lose your nerve when a flock of readers implore the editor to shoot you, or at least give them the pleasure of tasting your blood, as such an incident lends zest to the gentle occupation of trying to satisfy the terrific thirst of a lot of cheap skates who, for their little old one dollar a year in advance expect and demand a thousand dollars' worth of knowledge.

Many years ago, before the writer knew the game, there was one publication* that was so easy in giving up their money that I blush to think of the many ways that I lead them to hand it over to my care-taking, yet they survived many years of my treatment and are today in the very front rank of trade papers and just as willing to hand out the money as of yore. This journal has made repeated requests for more of my alleged writings, to all of which I have turned a deaf ear, because conditions have changed in the molding machine industry, for there were but few who even knew what a molding machine was fifteen to twenty years ago, while now there are hundreds, if not thousands, who know a lot about them and I do not care to take a chance of being Called by the younger generation.

That brings up another matter which will interest new writers and which is good policy to follow and that is to write on subjects that the generality of mankind are not conversant with, for then there is a better chance of "getting away with murder" with both the editors and readers. To illustrate this point, about seventeen years ago I wrote an article on lycopodium, a material then used as a parting compound, and an expensive one. To be fair in the matter I copied almost every word from an encyclopedia and was complimented by the editor for my Depth of knowledge.

Now, what would happen today if I attempted to write of parting compounds? Why there would be such a number of men who know so much more than I do on the subject that the clamor for my life would reach such a volume that my days as a writer would end then and there.

There is another feature of the writing game that has its serious side which I did not intend to include in this article, but as my main object in writing is the acquisition of the wherewithal, I may as well prolong the agony as I hope it will prolong the check, and that is the many letters received from the readers of articles who desire further information than that contained in said article or treatise. Now in all fairness to such seekers after additional data, it may not be remiss to mention the fact that all doctors and lawyers charge for their advice, and while they are not always paid, yet the glamor of charging for what they know will forever cling to them. While I admit that if I was paid for what I know I would starve to death on the proceeds, yet a warning is necessary to readers who presume that because a man has the nerve to subject himself to the ridicule of the reading public, he must needs be easy and only too willing to part with any knowledge they may have the audacity to ask for but not pay for. When a writer has fulfilled his obligations to the editor it means that there is an end to it.

While writing this article, a letter which was received a few days ago from a foreign country lies open before me, and the amount of information asked for means a great deal of burning of the midnight oil without even the price of the oil mentioned as pay. Now in all conscience I must protest against any such proceeding, as the information desired can be just as well obtained by the writer of the letter as anybody else, only he is apparently too lazy to dig it up for himself.

As to the merit of the contributions to the trade papers from sources other than those from the editorial staff, it is not reasonable to expect that each and every one is a gold nugget of information, as gold bricks will creep in even in the best edited paper ever printed. The readers, therefore, must understand that if at any time during one year's subscription period they find one new idea, one new wrinkle, one new formula or are compelled to think for themselves because some writer has awakened them from their Rip Van Winkle sleep, then that year's subscription is paid for then and there.

Any writer who expects decent treatment from his fellow-craftsmen is doomed to disappointment and he will be looked down upon by the very people whom he is trying to help, particularly if he dares to write on pattern-making. Patternmakers, as individuals, are prone to form themselves into a "committee of one" when anything is printed regarding their trade and the knocks they hand out to aspiring writers usually have the desired result in that the writer rarely commits the second offense and creeps back into his hole for life.

Writing for the trade papers then is not for the thin skinned, and if your skin is not such that a rhinoceros would envy, forget about ever attaining the height of being a writer.

W. H. Parry.

Brooklyn, N. Y., December 12, 1917.

*It is needless to state that this was Not The Metal Industry. —Ed.

PICKLING OF CARTRIDGE DISCS

To the Editor of The Metal Industry:

I have just finished looking over Shop Problems in The Metal Industry for Dectmber, 1917, and as my opinion differs from that expressed in your answer to Problem 2,518, under the head of "Pickling," I think possibly you may be interested in it.

The mill with which I am connected has put out millions of the discs referred to and has had more or less trouble from various causes. One of these is that the discs have had red stains on the surface. When the discs rejected for having red stains were few in number little attention was paid to it, as the appearance of the discs can be greatly improved by dipping in a bichromate of soda solution; but when the number greatly increased, the cause of the trouble was looked for, and at first was put up to the pickling.

An investigation showed that the discs with red stains usually were those that had been pickled more than once, and had been repickled because after the first pickling the discs had black blotches, and when these were removed the red stains were left. The pickling, however, was not the cause of the trouble. An examination of the piles of discs, after annealing and ready for pickling, showed that they ran all the way from those with a bright, shiny surface to those that were dark and dull in appearance. The former pickled clean, the latter did not. This seemed to put it up to the annealing, and the fuel oil was blamed.

The annealing soon proved an alibi. In watching the pans of discs as they were pulled out of the mufflle one could tell at a glance which would pickle clean and which would not. All or none might be one or the other; usually there were some of both. One disc would be nice and bright while its neighbor on the pan would have a dull appearance. This seemed to put it beyond the annealing.

It is the practice (in this mill) after rolling the bars of metal to the gauge to send them to the blanking presses, where a thin film of oil is put on the surface by rubbing a swab the full length of the bar. After blanking, no attempt is made to remove this oil, and the discs go to the muffle practically soaked in oil. When a good quality of oil is used the discs anneal bright and shiny and pickle clean; but when, as sometimes happened, a poor quality of oil was used the discs had the dull appearance. Looking after the quality of the oil used in blanking eliminated much, but not all of the trouble.

It was found that even when a good quality of oil was used in blanking, some of the discs came out of the muffle with the dull appearance. This puzzled us for a long time, until it was noticed that this particular trouble seemed to be worse on Monday morning than at other times. A few experiments showed that even when a good quality of oil was used in blanking, if the oil was allowed to dry and cake on the discs, and the discs then annealed, they would not pickle clean. By looking after the oil used on the blanking presses and annealing the discs before the oil had a chance to dry or cake, the trouble was practically eliminated. This, of course, may not be the cause of the trouble in the inquiry made, but will, I think, bear investigation.

December 17, 1917. PICKLER.

THIRD LIBERTY LOAN DRIVE STARTS FEBRUARY 15 OR MARCH 1, 1918

[The following letter is published at the request of John Price Jones, manager of the news bureau of the Liberty Loan Committee.—Ed.]

BRONZE AND GOLD.

To the Editor of The Metal Industry:

One billion pennies have been minted in this country in the last ten or a dozen years. Slowly this stream of bronze is being turned back in the direction of the National Treasury for war purposes. Gold has flowed into this country so rapidly in the last few years that by this time the United States has accumulated almost one-third of the world's supply of the yellow metal. In response to the call of the President, Americans are turning in this gold. From the poorest to the richest, Americans have borne their share. Stevenson's "aes triplex"—threefold shield of brass—is no more effective against the blows of the enemy than this double shield of bronze and gold.

A nation that prepares to enter a war first takes stock of fighting men, its guns, its gold and its food. It also will place on the credit side of its books the two items, thrift and courage. Without these two, all the material advantages of trained armies, war chests, fields of grain and wells of oil will count for little in a long-drawn contest. When disasters fall upon a nation, courage will steel its will. When the costs of war mount up to heights undreamed of before this contest, thrift will win the day.

When the first Liberty Loan was launched, the cry was heard quite frequently that this is not a thrifty nation and that the continental peoples have outstripped us in the practical application of individual savings to national finances. True, at the beginning of this war, when our export balance reflected in increased billions our prosperity, we showed little disposition to imitate the careful Frenchman. But those who complained in the early months of 1917, on the eve of the first Liberty Loan, of our unwillingness to save, have forgotten what this nation did when put to the test in the days of the Revolution and the Civil War. From the time of Joseph, when the forcible contrast of the lean years and the overflowing granaries brought home to the people the value of saving, nations have known how to make use of this primeval instinct. It is no new and strange practice, then, that the American people must adopt if they are going to win this war. There is no national aversion to thrift. The first two Liberty Loan campaigns proved incontestably that the American people know how to "save and serve." That they will continue in this self-sacrificing, forward-gazing spirit is not to be doubted. They have heard and heeded the President:

"Let every man and every woman assume the duty of careful, provident use and expenditure as a public duty, as a dictate of patriotism which no one can now expect ever to be excused or forgiven for ignoring."

Our war bills, growing heavier as the climax of the world contest draws nearer, cannot be met, however, by the same measure of thrift that characterized the first months. The United States must reach and surpass the mark set in France and Great Britain. In England, one bank alone, the London City and Midland, reports that its depositors applied for $451,198,000 of the last war loan, or considerably more than one-half the amount standing to their credit. This may give an insight into the compelling pressure of patriotism upon all classes of persons in England, for the London city and Midland reaches all social ranks. It must not be supposed that these English subscribers drew all their half-billion from the bank in order to pay for their bonds. Such a step would have resulted in grave trouble. This tremendous total could not have been lent to the Government without the most extraordinary thrift and self-denial.

New York, N. Y. GUY EMERSON.

Liberty Loan Committee.

MEN WANTED BY THE UNITED STATES

[The United States Public Service Reserve Department of Labor, Washington, D. C., has requested The Metal Industry to publish the following.—Ed.]

The Army and Navy staff departments continue to demand men of engineering experience, especially in industrial lines. At present the outlook is that this demand will continue throughout the period of the war. In calling attention to this the United States Public Service Reserve, Washington, D. C. (where records of men willing to serve when called will be kept on file), points out that a man of engineering experience has a rare combination of opportunities open to him, which are not open to the average patriotic American, as follows:

1. To serve the country in his most effective capacity.

2. To keep in touch with his own profession, with the result that his patriotic service will not have caused him to become rusty by the time peace returns.

3. To become a commissioned officer and receive much better pay than the average man who has wholly subordinated personal interests and now works for the national good.

4. To perform his service usually without leaving the United States.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

BLUING

Q.—Is there a cold solution for bluing steel parts such as are used on aeroplane motors and if there is such a method would the finish wear?

A.—The bluing of steel in a cold solution is not a very satisfactory proposition, but you might try the following:

Water by weight	5 parts
Gallic acid	1 part

and in this solution dissolve

Chloride of iron	2 parts
Chloride of antimony	2 parts

Mix thoroughly and apply to the steel parts with a sponge or by immersion. When dry re-coat if the color is not satisfactory. Finally wash in clean water, dry thoroughly and coat with a thin coating of linseed oil or lacquer.—C. H. P. Problem 2,524.

BURNISHING

Q.—I am plating pieces of soft cold rolled steel which vary in length from 3 to 15 inches for music stands. I am at present using a burnishing machine and a plating barrel and it is possible to run all the small pieces through the burnisher and then through the barrel and back to the burnisher and get good results, but when I attempt to run the long pieces through they come out bent and scratched. I am under the impression that if I had a burnishing barrel of the horizontal type, so that the pieces would not turn end wise it would be possible to finish the articles satisfactorily. Will you let me know your opinion on this subject?

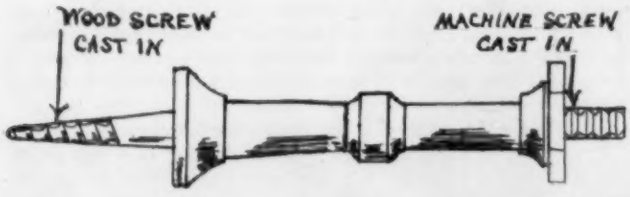
A.—Burnishing strips of steel fifteen inches long in a burnishing barrel is somewhat of a problem, especially in the ordinary tumbling barrels. The mere fact that small strips of metal up to four inches can be plated and burnished successfully while the long strips become bent and scratched, proves that they do not tumble freely but become wedged crosswise and the weight of the strips bend them and scratch them.

It might be possible to plate and burnish them in a horizontal barrel of the oscillating type. This would give a tumbling and a sliding motion to the pieces from one end to the other and this combined motion might solve your problem.—C. H. P. Problem 2,525.

CASTING

Q.—Can you give us any information in regard to casting pewter or soft metal in metal molds? We have several hundred soft metal spindles to make as per sketch, which are to be buffed bright when finished and we would like to have directions in regard to casting same, also formula for a suitable alloy.

A.—In casting soft metals the following suggestions may prove of some service.



First—The molds must be coated on the inside with French-chalk, jewelers' gold rouge (mixed with alcohol) or lamp black which may be applied from a gas jet, kerosene lamp flame or from a torch. Any of these coatings prevent the metal sticking to the mold, or in other words act as a facing to the mold.

Second—Always keep the mold cooler than the metal. A wet sponge fastened to a stick can be used for this purpose. The gate or lip of the mold should be cooled in water.

Third—Keep the heated metal clean and free from dross, if clean castings are wanted. The most commonly used and cheapest soft metal mixture is antimonial lead and for your purpose the alloy should consist of 88 parts of lead and 12 parts of antimony. Spelter gives a harder metal for casting purposes. Britannia metal is also used extensively in casting, but its cost would be prohibitive for your purpose. Such an alloy is composed as follows:

Tin	89.03
Antimony	7.0
Copper	1.08
Lead	1.08

—C. H. P. Problem 2,526.

COLORING

Q.—We are making gold-filled novelty cases which we finish inside by sand blasting, then swirling with emery and oil. We obtain a fine Damaskeen, but find it necessary to scratch brush and color the inside several times in order to obtain a good clear color. The repeated scratch brushings destroy the beauty of the Damaskeen. Can you suggest a remedy?

A.—After the cases have been sand blasted they should be given a quick dip in a dip composed of equal parts of nitric acid and oil of vitriol, then rinsed in cold water, dipped in a weak cyanide dip, rinsed in cold water again, then given a light color in a run-down gold solution. After the cases have been flash colored they should be well scratch brushed with a fine brass wire wheel, after which the cases are ready for the swirling lathe. It is bad practice to use oil for swirling, as it becomes rubbed into the metal and it is very difficult to wash off. For dry swirling, use a disk of felt charged with emery and glue. When using the wet process, use ordinary molasses or a very thin flour paste. The molasses or paste should be washed off with any of the alkaline cleaners, then the final color can be applied. If any stains appear in the final finish they can be removed by using a little wet saleratus and a string buff wheel. When nitric acid and oil of vitriol are mixed, the reaction generates enough heat to raise the temperature to approximately 166 deg. F. The dip for roll plate is always used cold, so it is necessary to mix the acids several hours before using.—O. A. H.

FLUXING

Q.—We wish to obtain a working formula to be used as a flux in the melting of aluminum borings containing the usual percentage of oil and dirt sold in the open market as commercial borings.

We would also thank you to inform us, if possible, the best flux to be used in the refining of aluminum skimmings and drosses.

A.—The writer prefers cryolite as a flux for refining aluminum borings, skimmings and drosses. A mixture of 6 parts of salt to 1 part of powdered fluor spar is cheaper, however, and gives good results. Large amounts of the flux (from 15 to 50 per cent. of the weight of the material to be treated) must be used. An open flame furnace, lined with bauxite, is the best melting device, although large crucibles heated in oil furnaces may be used.

Both fluor spar and cryolite may be contaminated with galena (lead sulphide), and they should be carefully inspected for this impurity as it will injure the recovered aluminum.

Oily turnings are likely to cake when being melted, and they may contain steel or cast-iron turnings. Hence it is desirable to remove the oil. The refiner can do this very satisfactorily with benzine, provided he can reclaim or utilize the dirty benzine. The small amount of benzine that will not drain off from the turnings may be removed by spreading them out on a cement floor and flashing off or burning the benzine. The iron can

then be removed by the use of a magnetic separator before the turnings are mixed with the flux.

It pays to keep oil and dirt out of aluminum turnings and to keep them free from brass, babbitt, iron and steel, as the recovered metal is purer and of higher market value in consequence.—J. L. J. Problem 2,528.

MIXING

Q.—We have your favor giving analysis of gun metal of tensile strength from 20,000 to 80,000 pounds per square inch. This is a very high grade metal and no doubt will answer our purpose for 45,000 pounds tensile strength, but probably is too high class metal for the 25,000 to 30,000 pounds tensile strength specifications.

The inquiry we are figuring on calls for bronze castings for gun carriages on U. S. Government inquiry for 155 M.M. gun carriage, model of 1918 Filloux. We are giving below description of pieces wanted for each tensile strength specification and if you can favor us with proper analysis of bronze to be cast suitable for these specifications we would thank you very kindly.

25,000 Specification.

Traveling lock pinion bearing	cast bronze
Shackle bushing	cast bronze
Handwheel body	cast bronze
Instruction plates	cast bronze

45,000 Specification

Rope snap case	cast bronze
Rope guide cap	cast bronze
Traveling lock bar case	cast bronze
Elev. and trav. gear box cover	cast bronze
Elev. and trav. gear box	cast bronze
Brake bracket bushing	cast bronze

35,000 Specification

The above pieces all call for cast bronze, you will note, and if you can give us any further information regarding suitable mixtures for these specifications we would appreciate it very much.

A.—The following mixture has been used for castings coming under the 25,000 specification, viz.:

Copper	62
Zinc	37½
Tin	1½
Aluminum	⅛

Our own preference, however, would be the following mixture which will give clean, smooth castings with much less trouble in the foundry:

Copper	76
Zinc	18
Tin	3
Lead	3

For the 35,000 specification use the well known 88-10-2 mixture or the following:

Copper	79
Tin	8½
Lead	½
Sheet brass	15

For the 45,000 specification use manganese bronze.—J. L. J. Problem 2,529.

MOLDING

Q.—We are making an aluminum casting 8½ x 7 x 6 inches and 3/32 inch thick, using a green sand core. We wondered if it would be possible to use a mold of artificial graphite still using the green sand core or could we make the core of graphite, too? Would the shrinkage of the aluminum alloy (92 per cent.) shrink on the graphite core enough to split the casting?

A.—A casting may be fed equally well by a chill or by a riser if these are properly placed. It is also true that graphite seems to be a more efficient chilling material than iron. However, unless the casting you mention has lugs or heavy sections, nothing can be gained by the use of graphite molds. It would certainly be impossible to use a graphite core as the alloy of aluminum 92, copper 8, has a shrinkage of 13/64 of an inch to the foot. Cores for this alloy in castings, such as we take yours to be, are usually made with plenty of rosin so that the heat of the molten metal during pouring will soften the core and allow it to be compressed as the casting cools. Often the inside of the core has to be hollowed out, leaving only a shell remaining, so that it may be easily crushed by the contracting casting.

Perhaps you have in mind making an aluminum casting that will not require any finishing or in other words the equivalent of an aluminum die casting. In these castings the shrinkage is said to be controlled by varying the copper content, the alloys with the higher percentage of copper, shrinking the least. Steel molds, heated very hot, are supposed to be used in this process.—J. L. J. Problem 2,530.

NICKELING

Q.—We have a proposition to polish and nickel iron pipe bath supplies that have been galvanized. The idea is to leave the galvanizing on, polish and smooth, copper plate, then nickel, and color in nickel. We do not seem to have any success in the plating and coloring of them. Can you help us in any way? We polish them first with No. 70 emery and finish with No. 150 emery, and then buff with regular tripoli; then we copper plate them and then color them in the copper and nickel.

A.—As hot galvanizing is usually applied to rough iron pipe, it would be necessary to cut away the entire zinc surface to obtain a smooth surface free from scratches and in order to obtain a final nickel-plated surface with a high lustre.

If the iron pipe coated with zinc is not unusually rough, then you can probably produce a good smooth surface without polishing the zinc away entirely. We would suggest that the zinc surface be polished with a tampico wheel, using emery paste of about 180 to 200 mesh in fineness. If this operation produces a uniformly smooth polish upon the zinc that is all that is necessary.

After cleansing plate in a warm copper solution containing not less than 3½ ounces of actual metal per gallon, the following formula gives excellent results:

Water	1 gallon
Sodium cyanide	5¾ ounces
Copper cyanide	5 ounces
Soda ash	4½ ounces
Sodium hyposulphite	¼ ounce

The temperature of the solution should be 120 degrees Fahr. and voltage 3½. If the tubes are plated for twenty minutes in such a solution, a good heavy coating can be obtained. Buff the copper-plated surface with a white composition, then cleanse and nickel plate, and then finally polish the nickel-plated surface.—C. H. P. Problem 2,531.

PLATING

Q.—What is the most practical way of copper plating carbon brushes for motors?

A.—There is only one practical way to plate carbon brushes and that is in the acid copper solution consisting of the following materials:

Water	1 gallon
Sulphate of copper	1¾ pounds
Sulphuric acid	4 ounces
Epsom salts	4 ounces

Voltage should be 1 and the temperature of the solution 70 degrees Fahr.

In plating, the carbon brushes should be supported from the top and bottom so that a good contact is secured. Frames for plating could be arranged so that a number of brushes could be plated at one time.—C. H. P. Problem 2,532.

TESTING

Q.—We have about 700 college seal blanks, one-half inch diameter, 16 gauge. About one-third are 10K, while the balance are 14K. Is there any simple method of testing the pieces so they can be separated?

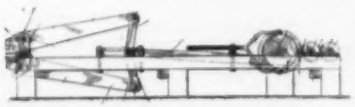
A.—Wash the blanks for a few moments in a hot caustic soda wash, then rinse in hot water and dip for a few seconds in pure nitric acid. The 10K blanks will turn dark brown; the color of the 14K blanks will not be affected.—O. A. H. Problem 2,533.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,245,460. November 6, 1917. **Machine for Cutting Metal Bars.** C. F. Hoffman, Norfolk, Va.

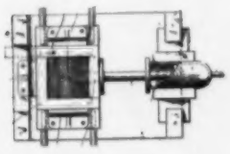
This invention relates to a machine, as shown in cut, for cutting metal bars and has for its object to provide a simple, cheap and portable machine of this class which may be set up and used wherever power is obtainable, and is particularly useful as a machine which may be employed with great economy by contractors for buildings and other large structures where a great number and variety of steel bars are used.

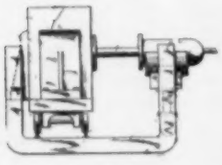


Another obpect of the invention is to provide a machine of this class with certain parts made of metal that may be readily mounted and dismounted from a frame which can, if so disposed, be made of wood, and when disassembled these parts may be readily shipped whenever desired and can be handled readily during shipment as the separated parts are relatively light and occupy comparatively little space.

1,245,687. November 6, 1917. **Apparatus for Treating Metals and Their Alloys.** A. M. Craig, New Haven, Conn.

This invention relates to improvements in an apparatus for casting and compressing metals and their alloys, and the object of the invention is to produce an apparatus by which a charge soon after being poured can be subjected to heavy, unyielding, incremental pressures so that the resulting mass can be very much condensed and compressed, thereby giving a greatly increased tensile strength, powers of resistance, and making it generally stronger and adapted for purposes for which ingots formed in the ordinary way can be used. An object of the invention is to arrange the apparatus, as shown in cut, so that the charge can be conveniently handled and compressed, and further to construct the mold members so that they will slide upon each other when the charge is under compression, thereby permitting pressures to be applied to the charge.





1,245,862. November 6, 1917. **Soldering Compound for Various Metals.** Wm. Brierly and H. B. Moore, Vanderbilt, Pa.

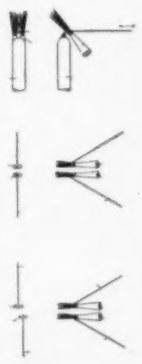
This invention relates to soldering compounds for various metals and alloys in which the fusing point of the metal or alloy used in the compound is lower than the fusing point of the two parts of metal to be joined, and greater than the fusing point of the other three ingredients of the compound. In some cases a piece of metal whose density is the same as that of the two parts of metal to be joined will answer the purpose. One of the principal objects of the invention is to provide a compound for soldering gold or any other alloy, silver, brass, copper, iron or steel or any two pieces of metal, the fusing point of which is greater than the soldering compound.

In carrying out the invention the following ingredients are taken for a pound of the soldering compound, and mix by heating:

Borax	5	ounces
Paraffin	4½	ounces
Vaseline	4½	ounces
A metal (of lower fusing point than the metal to be soldered)	2	ounces

1,245,536. November 6, 1917. **Process for Atomizing Metals in a State of Fusion.** F. C. Ucar, Madrid, Spain.

It is known that if in the formation of a voltaic arc one or more metal electrodes are employed, these metal electrodes become fused in the zones between which the arc passes; among other applications, the various methods of electric welding are based upon this fact.



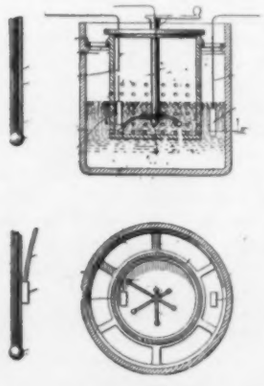
On the other hand, if a liquid body is acted upon by a gaseous current that is capable of carrying it along with it, this body is divided into particles of a greater or less degree of tenuity in accordance with the fluidity of the body and the violence of the gaseous current.

One of the objects of the invention is to improve such a process for the production of metallic films with reference to the action of the non-oxidizing gaseous current.

According to the invention, as shown in cut, the current of non-oxidizing gas is directed upon the electrode or electrodes in such manner that while passing over or impinging upon the electrode or electrodes, it does not reach the arc which is formed without preliminary contact of the electrodes.

1,246,083. November 13, 1917. **Electro-plating.** Harvey N. Gilbert, of Brookline, Mass., assignor to American Optical Company, of Southbridge, Mass., a voluntary association of Massachusetts.

This invention relates to improvements in means for and the method of electro-plating, and has for its primary object to reduce the time and cost of the plating operation to a minimum and to insure against any waste of the plating material.



Other objects as well as the advantages and improved features in the method of operation of the invention should be apparent from the accompanying drawings.

The patent covers:

In an electro-plating apparatus, the combination with a container for the articles to be plated, and an electrolyte in the container, of an anode in the electrolyte and a movable stirring member having a plurality of agitating fingers of different lengths, said fingers being themselves insulated from the electrical circuit of the apparatus but each terminating in a cathode contact, the several contacts being disposed at different distances from the center of movement and at different heights from the bottom of the container, whereby most thorough agitation and contacting with the various articles is insured.

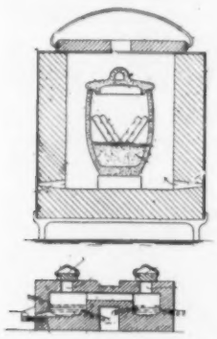
1,246,802. November 13, 1917. **Metal Tempering Compound.** A. S. Carlson, Denver, Colorado.

This invention relates to a metal tempering compound, the same being more especially intended for tempering tools, made of steel, such as reamers, drill steels, taps and springs. This compound will prevent the most delicate tools from cracking and its effect is not only to harden but to toughen the material of which the tools are composed.

The compound consists of a mixture of kerosene and creosote preferably in the proportions of ten gallons of kerosene to one gallon of creosote. These ingredients are simply mixed together whereby a homogeneous compound or composition is formed which is at all times ready for use for tempering purposes.

1,246,571. November 13, 1917. **Process of Making Metallic Alloys.** H. Eldridge, New York, N. Y.

The present invention consists of a process for making alloys of metal by heating the less fusible metal to an alloying temperature, and subjecting such heated metal to the vapor of a more fusible metal and effecting a complete union of the metals in a molten state.



Such alloys can be formed at a temperature below the melting temperature of the less fusible metal, and the process can therefore be effected by heating the less fusible metal to an alloying temperature without melting it, as shown in cut, or it may be effected by melting the less fusible metal.

The process is especially applicable to the manufacture of any alloy of copper with such metals as zinc, antimony, lead, tin or other volatile metals which melt and volatilize at a relatively low temperature, and are therefore liable to material loss by volatilization if the alloying metal be melted with the copper in an open vessel.

1,247,086. November 20, 1917. **Method of Coating Metallic Articles to Prevent Oxidation.** M. L. Crowe, Holliston, Mass.

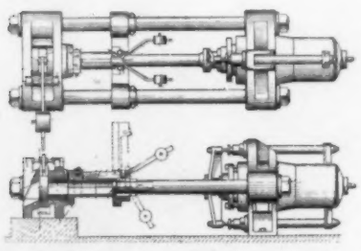
The object of this invention is to provide a method or process of treating articles of manufacture, or parts thereof, constructed of iron or steel, so as to form thereon a black or dark-colored finish or coating which is rust-resistant and which improves the appearance thereof.

The process which accomplishes the desired purpose consists in dipping the articles to be treated in a molten bath of caustic alkali and a nitrate of the alkali metals.

The inventor preferably employs sodium hydroxide and sodium nitrate because of the excellent results secured by their use. These two substances in dry form are thoroughly mixed, and after being placed in a suitable receptacle are heated to a temperature of from 900° to 1,200° F. They fuse at approximately 400° F., and when they reach 900° F. a scum appears which has been noted as roughly indicating that the bath is ready for use.

1,247,667. November 27, 1917. **Briquetting Machine.** Thomas Gilmore, Jr., of Brooklyn, N. Y., assignor to General Briquetting Company, of New York, N. Y., a corporation of Maine.

This invention relates to briquetting machines or presses and more particularly to machines or presses for briquetting metal or mineral fines through the medium of pressure and without the use of a binder of any kind. The improvement has for its object to provide a simple machine of the indicated type, as shown in cut, wherein the process of briquetting is efficiently carried out, which works at low tonnage capacity and wherein the well-known advantages of briquetting are brought within the reach of smaller foundries and industrial plants ordinarily incapable of installing and supporting the high capacity, expensive machines heretofore found necessary to secure proper working. A further object of the invention is to provide a briquetting machine in which the difficulties of feeding the material, packing it preparatory to the use of heavy pressure and removal of the finished briquets from the machine which ordinarily exist in such machines, are entirely overcome or at least reduced to a minimum.



1,246,996. November 20, 1917. **Buffing and Polishing Machine.** Leo L. Pfeifer, of Columbus, Ohio, assignor to the Jno. W. Brown Manufacturing Company, of Columbus, Ohio, a corporation of Ohio.

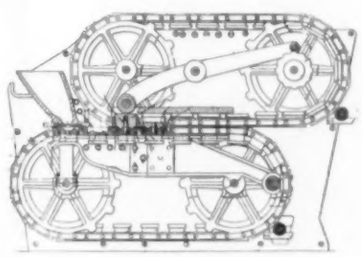
1,248,053. November 27, 1917. **Process of Rust Proofing Iron and Steel by Vapors Containing Phosphorus Compounds.** William H. Allen, Detroit, Mich.

This invention relates to the treatment of articles of iron and steel by means of vapors containing compounds of phosphorus in order that their surfaces may not be affected by atmospheric conditions.

The present invention consists in subjecting articles of iron and steel, properly cleaned by pickling or sand blast, to the fumes or vapors of phosphorus pentoxid or anhydrid, together with some aqueous vapor, until surfaces of basic phosphates of iron are produced. These vapors may be produced in any desired manner, the preferred process consisting in subjecting a mixture of ground phosphate rock, coke and sand to a strong current in an electric furnace. The liberated phosphorus immediately changes to P_2O_5, and these fumes are drawn into the processing chamber by means of a suction fan. If desired, the fumes may be first passed through a dust chamber to remove impurities.

1,248,453. December 4, 1917. **Die-Casting Machine.** John Caer, Hamilton, Ontario, Canada.

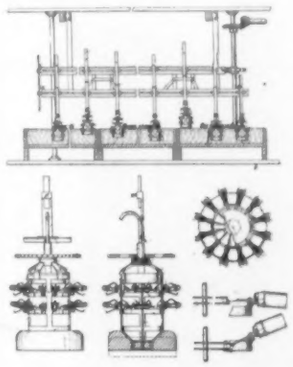
The principal objects of the invention are to materially reduce the cost of molding small articles and to devise a machine which will insure uniformity in size and weight of the molded articles.



The present invention relates to that class of molding machines, as shown in cut, in which the molds are formed by a plurality of movable members arranged in separable sections and adapted to be brought together to complete the mold, and the principal feature consists in the novel construction and arrangement of parts, whereby the quantity of metal to each mold is accurately gauged and pressure is applied to the upper mold to complete the formation of the article and whereby the completed members are automatically discharged.

1,249,286. December 4, 1917. **Electro-plating Apparatus.** Elmer B. Stone, of New Britain, Conn., assignor to the American Hardware Corporation, of New Britain, Conn., a corporation of Connecticut.

This invention relates more especially to that class of electroplating apparatus, as shown in cut, in which the articles are automatically subjected to different baths employed in the plating process, and an object of the invention, among others, is to provide an apparatus of this class by means of which hollow articles may be advantageously treated.



The patent covers, among other claims, an article carrier frame adapted for use in an electroplating apparatus and including a plural number of article holders pivotally mounted on said frame and having extensions radially arranged thereon, an actuating rod extending longitudinally through the center of the frame and in engagement with said extensions, a float secured to the lower end of the rod, and a secondary float secured to said rod.

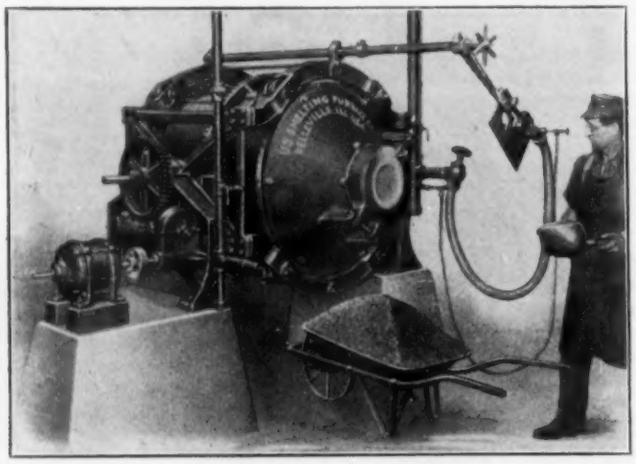
An article carrier frame adapted for use in an electroplating apparatus and including a plural number of article holders pivotally mounted on said frame and having extensions therefrom, an actuating rod extending longitudinally through said frame and in engagement with said extensions, a float secured to said rod, a secondary float secured to the rod, and a stop located in the path of movement of the secondary float to control the amount of movement of said rod.

EQUIPMENT

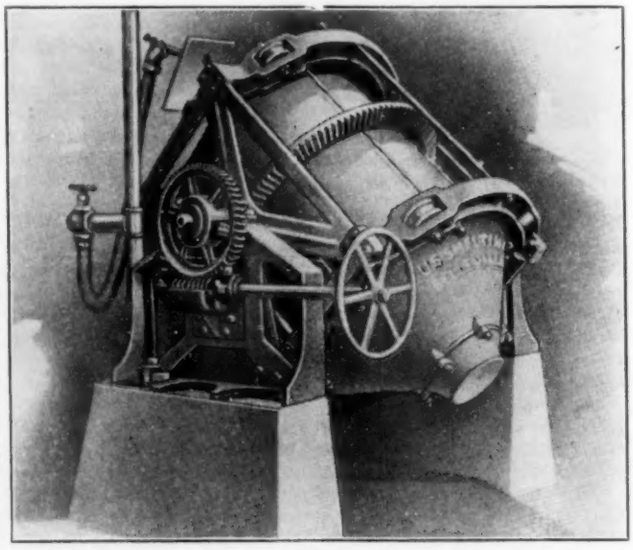
NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

REVOLVING TILTING METAL MELTING FURNACE

A new furnace for the melting of metals which possesses some novel features is shown in the accompanying pictures and is now being placed upon the market by the U. S. Smelting Furnace Company, Belleville, Ill. At first glance this furnace does not differ materially in form of construction and operation from the many types of non-crucible tilting furnaces at present on the market. However, a close inspection of the photographs will reveal the fact that this furnace is equipped with not only the usual mechanical means for easily tilting it to discharge the melted metal, but it is also provided with a simple mechanism which enables it to be revolved during the process of melting.

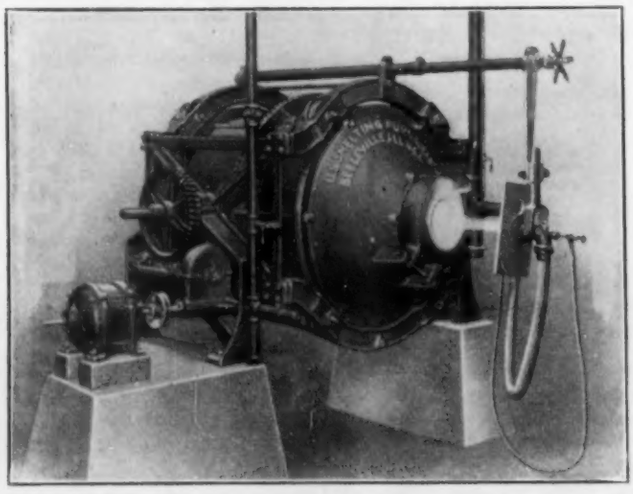


CHARGING THE FURNACE.

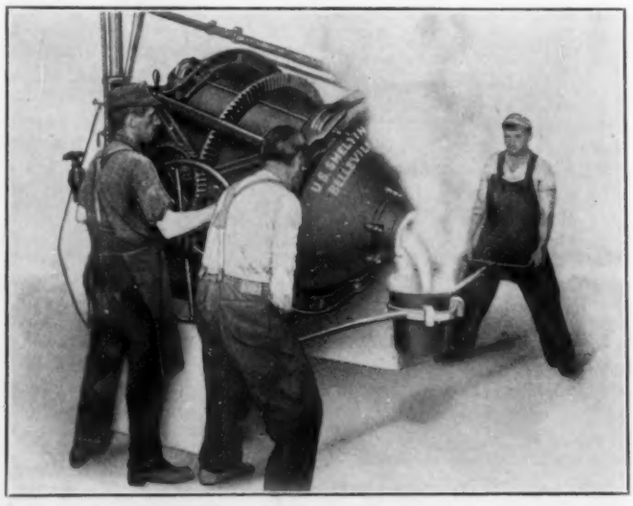


TILTED TO POURING POSITION.

The burner for this furnace, which operates either by means of oil or gas, is placed, as is shown, outside of the charge door. The heat therefore is delivered through the middle of the furnace in a rapidly expanding form and is finally distributed throughout the furnace due to the revolutions of the entire furnace body. This insures the even distribution of the heat while the metal is slowly kept in motion as the furnace revolves, thus bringing the intensely heated refractory lining beneath the molten metal and applying the heat at the bottom as well as at the top. The required pouring temperature is quickly reached and a completely purified and refined metal is obtained.



MELTING THE CONTENTS.



POURING THE MOLTEN METAL.

The furnace is particularly adapted for the quick and economical melting of copper, yellow brass turnings and grindings, aluminum and white metal and even ores and the manufacturers of the furnace claim a minimum loss by the use of this furnace in the melting of these alloys, which under pit-fire conditions are subject to large shrinkages. This feature, they claim, is due to the even distribution of the heat as outlined above and also to the fact that the apex of the flame does not impinge directly upon the metal charge as is the case with other furnaces of this type. The tilting of the furnace in order to pour off the metal is said to be unusually easy and the furnace can be tilted and returned to the vertical position in a surprisingly short

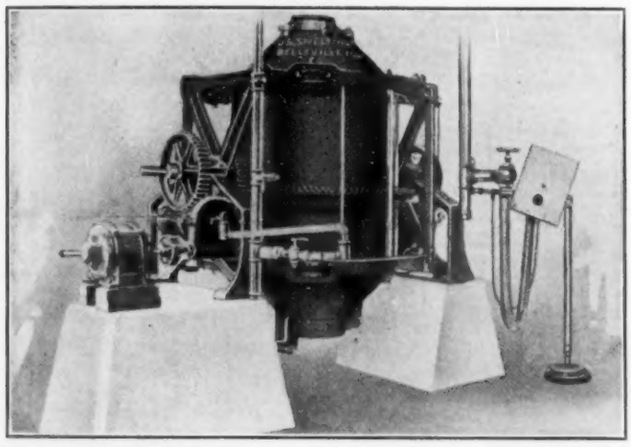
time, thus saving on all four items of time, labor and metal.

Another point about the tilting feature of the furnace is that it is possible to turn the furnace to an absolutely perpendicular position, thereby allowing every ounce of metal to flow from the dome shape pouring hole and this enables a melter to make several different kinds of mixtures without danger of any contamination. No slag remains and the furnace is absolutely free and clean after each and every heat.

Some very interesting and convincing tests have been made with this furnace and two of these are given below:

TEST ON YELLOW BRASS—TOTAL CHARGE.

CRUCIBLE FURNACE.		U. S. FURNACE (no crucibles).	
Ingot copper...	3,714 pounds	Ingot copper...	3,770 pounds
Scrap copper....	673 "	Scrap copper...	557 "
Zinc	2,025 "	Zinc	2,000 "
Lead	337 "	Lead	330 "
Tin	168 "	Tin	165 "
Yellow ingot....	18,800 "	Yellow ingot...	18,800 "
Yellow turnings	10,000 "	Yellow turnings	10,000 "
Gates	4,283 "	Gates	4,378 "
Yellow scrap...	10,000 "	Yellow scrap....	10,000 "
Total melt.....	50,000 "	Total melt.....	50,000 "
Production	47,460 "	Production	47,365 "
Loss in melt....	2,540 "	Loss in melt.....	2,635 "
Per cent. loss in melt	5.08%	Per cent. loss in melt	5.27%



TILTED TO HORIZONTAL POSITION TO DRAIN THE LAST DROP.

YELLOW METAL.

	CRUCIBLE FURNACE.		U. S. FURNACE.	
Copper @28⅞c....	65 pounds	..$18.77	65 pounds	....$18.77
Zinc @10c. ...	30 "	.. 3.00	30 "	.... 3.00
Lead @11½c....	05 "	.. .59	05 "	.... .59
	100 "	..$22.36	100 "	....$22.36
Per cent. loss...	5.08%		5.27%	
	94.92		94.73	
Average cost per 100 pounds of mixture		$23.55	.....	$23.60
Cost of fuel.....		.49	.....	.27
Cost of crucible and linings.....		.98	Linings	.0005
Total per 100 pounds		$25.02	.....	$23.8705

Crucible Furnace Total Cost per 100 pounds melted metal $25.02

U. S. Smelting Furnace Total Cost per 100 pounds melted 23.87

1.15

A saving of $1.15 per 100 pounds by U. S. Smelting Furnace. Fuel oil cost 10¾c. per gallon.

The cost of crucibles used in the crucible furnace, during this comparative test was 16½c. per number. The oil consumption in the crucible furnace was about 4½ gallons per 100 pounds and in U. S. Furnace 2½ gallons, both include the oil required to preheat furnaces.

The total of 50,000 pounds of metal melted, was made in charges of 950 pounds to 1,150 pounds in the U. S. Furnace and 650 pounds in the crucible furnace. The total amount of metal melted in this company's plant is about 27,000 pounds per day and at a saving of $1.15 per 100 pounds would net them a total saving of $310.50 per day, in fuel and crucibles. This plant also sells more than a car load of brass emery grindings which would at least save them 10c. per pound. This alone is a considerable item.

TEST OF BRASS EMERY GRINDINGS.

Total charge of grinding.....	9,000	pounds
Total metal recovered.....	6,624	"
Total slag	1,800	"
Total metal loss.....	576	"
Weight of charge per heat.....	800	"
Total oil consumption.....	247	gallons
Total oil consumption per charge of 800 pounds	22	"
Total oil consumption per 100 pounds.....	2¾	"
Total time to melt 800 pounds charge.....	2¾	hours
Fuel oil 28 degrees B. distillate.....	4c.	per gal.
Total charge	9,000	pounds
Total metal recovery.....	6,624	"
Slag and metal loss.....	2,376	"
Total slag	1,800	"

Total metal loss..... 576 or 8%

Total oil consumption 247 gallons @4c. equals $9.88.

At the time this test was made this firm was paying 24c. per pound for a red metal ingot. The mixture was 85% copper, 5% tin, 5% zinc, 5% lead.

The total recovery of ....6,624 pounds @24c. equals	$1,589.76
The total oil cost.....247 gallons oil @4c. equals	9.88
Total value of recovery.....	1,599.64
If they had sold 9,000 pounds @5c.....	450.00
Total saving	1,149.64

At first this firm poured this metal into ingot molds but later found it unnecessary and poured direct into castings, thereby saving melting cost and another metal loss. The castings were produced as good as those poured of new mixture.

NEW INSTALLATION IN A BRASS FOUNDRY

One of the recent additions to the brass foundry of the Fore-River Ship Building Corporation, located at Quincy, Mass., is the installation of a new reverberatory furnace for the sole purpose of melting manganese bronze. This furnace has a capacity of seven tons of metal per heat which is about fourteen times that of the No. 400 crucible, the largest sized crucible used in the foundry and which costs at the present time about $68 and usually lasts about five or six heats. It is estimated that the new furnace will save the corporation about $7,000 per month and it was manufactured by the Alfred Thomas Company of Pittsburgh, Pa. About five hours are required to get the first heat out and two hours for succeeding heats. The melting loss, up to the present time, has averaged from 4½ to 5 per cent. on manganese bronze.

The Fore-River Ship Building Corporation is operating its foundry to full capacity and is also using Hawley-Schwartz furnaces which are manufactured by the Hawley Down Draft Furnace Company, of Easton, Pa., for melting red brass with a loss of about 3 per cent.

The management of this foundry is in charge of S. W. Chappell, Jr., and S. R. Bain, who are meeting all requirements in a satisfactory and up to date manner, as the government specifications call for severe tests and high tensile strength while some of the castings have to stand a hydraulic pressure of from 500 to 1,000 pounds.

THE ALUMINOTHERMIC PROCESS AND ITS APPLICATION IN THE NON-FERROUS INDUSTRY

WRITTEN FOR THE METAL INDUSTRY BY ARTHUR F. BRAID, METALLURGICAL ENGINEER.*

Aluminum, as is generally known, is the most widely distributed metallic element in the earth's crust, but the reason that it is a comparatively expensive metal as compared to iron and other of the more common metals is because where aluminum is found it is always in combination with oxygen in one form or another, and it is only within comparatively recent years that any commercial process has been perfected which will separate aluminum from oxygen and enable the metal to be produced at a cost to make it generally available.

ARTHUR F. BRAID.

Frederick Wohler succeeded in obtaining very small quantities of metallic aluminum about the year of 1827, but for eighteen years after that the metal in any considerable quantity was really unknown, and it remained for a French chemist, H. St. Claire De Ville, to isolate aluminum into a state of almost perfect purity and determine its true properties. This was in 1854. At that time, however, only very small quantities were available. It remained for another French chemist, Heroult, and an American metallurgist, Hall, to really produce aluminum in large quantities at a reasonable price, and this was worked out simultaneously by Heroult in Europe and Hall in America, both using the electric furnace for reducing the aluminum ore. As a result of this, practically all aluminum produced abroad is made under the Heroult patents and in America under the Hall patents.

The fact that aluminum is hard to separate from oxygen is taken advantage of in the Thermit process, as it is possible to start a chemical reaction between the two when they are treated to a sufficiently high temperature. Chemists for many years since aluminum was discovered have known of this reaction and experimented with it in the reduction of different oxides, mixing finely divided aluminum with a metallic oxide, placing the mass in a crucible and then heating until the reaction took place. It was found that this resulted in a very violent reaction, practically an explosion, so that the reaction was of no commercial value. Dr. Hans Goldschmidt discovered that this reaction could be controlled if, instead of heating the entire mass, he simply heated the mass in the crucible at one spot. The reaction would then spread through the rest of the mixture and at the end of the reaction he would have aluminum oxide or slag floating on top in a molten state and the reduced metal at the bottom of the containing vessel. This discovery was the result of experiments by Dr. Goldschmidt, who was attempting to produce pure metals to use as alloys with steel, and the first experiments were made with chromium oxide and fine divided aluminum. This reaction was entirely satisfactory, as the aluminum combined with the oxygen in the chromium oxide and pure chromium metal was produced.

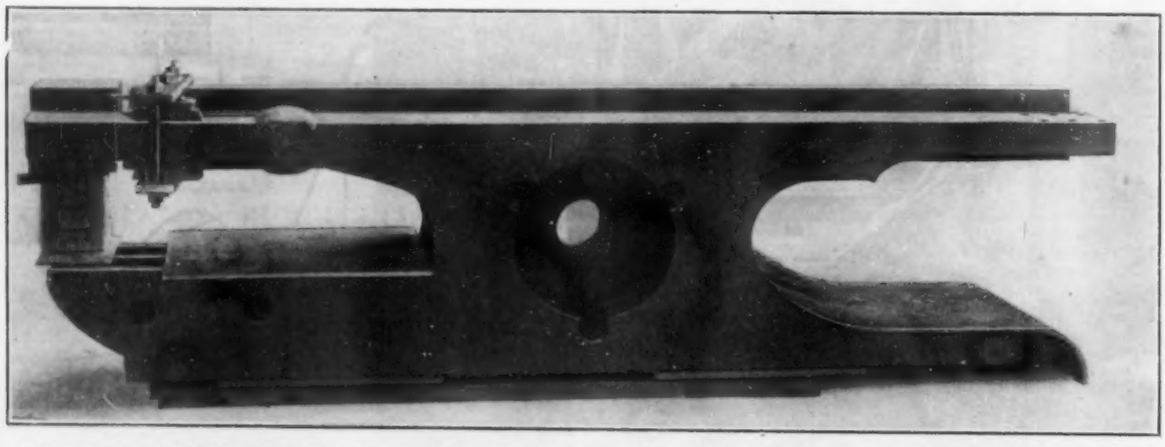
Among other oxides experimented with was iron oxide, but he found that this reaction not only produced a very pure low carbon steel, but that the heat of this reaction was extremely high. No pyrometer will measure this temperature, but it has been worked out theoretically by Professor Richards, of Lehigh University as approximately 5,000° F.

THERMIT PROCESS FOR WELDING.

Dr. Goldschmidt decided that this intense heat, produced so quickly and easily, could be used in many ways for welding purposes, and the Thermit process which is now so widely known throughout the world is the result.

In making a Thermit weld, the parts to be united are first arranged with a space between them varying from one-half inch to two or three inches, depending upon the size of the sections. Where the pieces to be welded are in two parts it is a simple matter, of course, to provide this space, but in the case of a fracture it is often necessary to cut out the steel in order to provide the space needed, and this is done by drilling a line of holes along the fracture and then cutting out the metal between the holes, or else the space is cut out by means of the oxy-acetylene cutting flame.

In most cases it is almost always necessary to cut out the fracture. After the sections have been cut out a wax pattern is formed around them of the exact shape of the reinforcement of Thermit steel, which is to be cast around them to make the weld. Thermit, as already explained, is a mixture of aluminum and iron oxide, which, when ignited, reacts. The aluminum combines with the oxygen of the iron oxide, while the iron is set free and comes down as a highly superheated liquid steel at a temperature of nearly 5,000 degrees Fahrenheit, or about twice the temperature of ordinary molten steel. It will be readily seen that when this steel is poured around the sections to be united it will melt those sections and amalgamate with them so that the whole will cool down to form a single homogeneous mass.



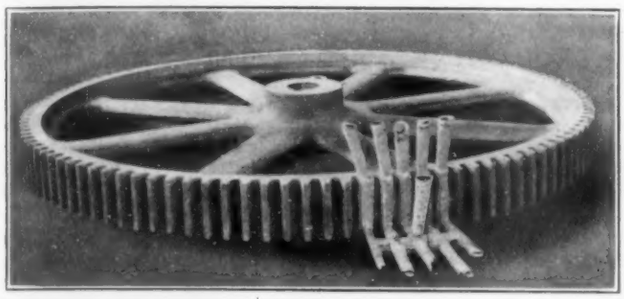
A JOB OF WELDING AT THE PLANT OF THE BUFFALO COPPER AND BRASS BRANCH OF AMERICAN BRASS COMPANY, BUFFALO, N. Y.

The principal users of Thermit are the railways, street railways and steel mills. The railways use it for welding locomotive frames, crossheads, guide yokes, driving wheel spokes and centers, etc., while the street railways use it for welding their rails in order to eliminate the mechanical joints. Welded joints are permanent and add greatly to the electrical and mechanical efficiency of the track. In steel mills the process is used for numerous important repairs of such heavy sections as broken rolls,

*Goldschmidt Thermit Company, New York.

pinions and crank shafts. It is in great demand by practically all the steel mills in the country. Of course, the process is extensively used for all kinds of emergency repairs, such as broken stern posts, rudder frames and tail shafts of steamships, crankshafts for large oil and steam engines and other broken parts too numerous to mention.

Having once produced a practically pure carbon-free chromium and iron or steel, by means of the reduction of their oxides with aluminum, it was a simple matter to reduce other oxides in a similar manner. There are now about twenty pure carbon-free metals and alloys on the market which are produced directly or indirectly by the aluminothermic process. The most interesting of these, to the non-ferrous industry, are the following: 95 per cent. pure manganese, manganese titanium (30% Ti.), Manganese-boron (30% Bo.), and titanium-copper (10% Ti.). There are also the two well-known alloys of 30/70% manganese-copper and 25/75% manganese-aluminum, which are made by alloying



THERMIT WELD IN A GEAR WHEEL AT PLANT OF MANHATTAN BRASS COMPANY, NEW YORK.

pure carbon-free manganese metal with electrolytic copper and pure ingot-aluminum respectively.

These products are used as deoxidizers or purifiers of molten metal, each one of which is particularly adapted to a certain branch of the non-ferrous industry.

Manganese or manganese-copper is used very extensively in manganese-bronze and also in nickel silver. In the latter the manganese is used simply as a purifier, whereas in the former, or manganese-bronze, there is, or should be, a content of manganese which increases the tensile strength. Manganese-copper can be used in most non-ferrous mixtures, particularly yellow bars.

Manganese plays a dual role in both the ferrous and non-ferrous industries, as it is not only a powerful deoxidizer, but desulphurizer as well.

Manganese-titanium and manganese-boron are used for purifying various special bronzes and certain white metals containing nickel; also in copper castings requiring high electric conductivity. Titanium copper is used principally in titanium bronze. Since the war started there has been an increasing demand for high-speed steel, and in the manufacture of stellite, which is a non-ferrous material, large quantities of pure cobalt, chromium and manganese are used. The manufacture of high-resistance wire, such as nichroma, for electrical purposes, also consumes large amounts of pure chromium and manganese.

There is a steadily growing demand for aluminothermic metals and alloys, and the writer has only attempted to describe briefly the most important uses for these products.

BARIO METAL

A new metal known by the registered name of Bario has been put upon the market by the Bario Metal Corporation, New York, as a heat and acid resisting material. The manufacturers claim that this is the only commercial metal of its kind that does not rust, tarnish, corrode or deteriorate. It is, they state, non-magnetic and stays always clean and bright, and is not attacked by sulphuric, nitric or muriatic acids, resembling in this respect gold and platinum.

The melting point of Bario is high, beginning at 3,100° F. and increasing according to the grade of metal mixture used. Bario metal is manufactured in nine different grades, which are enumerated as follows: Bario A, jewelry and dental purposes; Bario B, tableware, cigarette cases, cane handles, buttons, shoe buckles, vases, metals; Bario C, gas and electrical fixtures, doorknobs, railings, bathroom fixtures, name plates, harness and motor car trimmings, auto initials; Bario D, surgical instruments; Bario E, contact points for autos, aeroplanes, telegraph, wireless and all electrical purposes, also phonograph needles; Bario F, knives and tools; Bario G, laboratory utensils; Bario K, chemical plants, sugar refineries, canneries, superheated and high-pressure steam parts, pumps, propellers, equipment for packing houses, canners' equipment, platers' and pickling tanks, dyeing, bleaching and laundry machinery, refrigerating machines, dairy machines and Bario L, kitchen utensils, ovens, food containers, ice cream tanks.

PLATIN-NIG

A New Substitute for Chloride of Platinum for Oxidizing Gold, Silver, Copper, Bronze and Brass.

By Charles H. Proctor.

A new material in the plating industry that has been placed on the market as an oxidizing medium to replace the very expensive platinum chloride is known as Platin-Nig. This material is manufactured by the Roessler and Hasslacher Chemical Company, New York, N. Y.

Platinum chloride has been used for years to produce a black non-tarnishable surface on silver or silver-plated products of the better grade by what is termed the "painting on" or localizing method. This method consists of painting the silver or silver-plated surface with the platinum chloride solution. The article is afterwards heated by a bunsen flame or may be heated previous to applying the platinum chloride. The heat so applied at once produces an intense black tone which, being of a soft non-tarnishable nature, is readily relieved from the high lights by the usual methods, giving the black and silver in relief.

Platin-Nig gives identically the same results and the application is the same for gold and silver, except when the immersion method is used, for then a dilute solution is employed at a temperature of 200 degrees Fahr. The lower price of Platin-Nig also makes it a very attractive material to use, as it is being sold at the present time for $12.50 per avoirdupois pound, against $40 per ounce for platinum chloride.

Tests made with Platin-Nig have shown very excellent results and a number of concerns have adopted it. It has the same characteristics as platinum chloride. A patent has been applied for covering Platin-Nig. The following method is used for preparing a stock solution for painting on the articles:

Water	8 ounces
Muriatic acid	4 ounces
Platin-Nig	1 ounce

To prepare the solution, add 4 ounces of muriatic acid to 4 ounces of water and heat to the boiling point. Then add the 1 ounce of Platin-Nig and stir until it is dissolved, and finally add the remaining 4 ounces of cold water. This is the stock solution and should be bottled for use. The method followed for applying the stock solution for "painting on" is to heat a portion of the stock solution in a beaker glass to 180 to 200 degrees Fahr. Maintain the solution at this temperature while applying the solution to the silver or silver-plated parts. A piece of felt may be used to advantage for applying the solution to the articles. The work should not be too cold when applying the plating, as the results are more effective when the material treated is slightly warm.

For oxidizing by immersion a solution should be prepared as follows:

Boiling water	1 gallon
Muriatic acid	4 ounces
Stock Platin-Nig solution	2 ounces

Mix the materials thoroughly and maintain at a temperature of not less than 200 degrees Fahr. In order to maintain the strength of the solution a small amount of acid and Platin-Nig solution should be added occasionally. This will be readily noted when the solution colors very slowly, as usually the deposit is obtained at once. The water lost by evaporation should be added as required.

The manufacturers state that they have no doubt but that

Platin-Nig will meet with success at this particular time when other oxidizing materials are so expensive.

ADVOCATING THE USE OF HIGH GRADE COMPOSITIONS

A Letter Written to the Sales Department of the Matchless Metal Polish Company, New York, by P. W. Ellwanger, General Manager.

There seems to be some doubt about vital facts in the sale of our high-grade compositions and in the manner that these facts should be placed before the prospective purchaser. We have always felt, and see no reason for changing our opinion, that pertinent facts backed by your own knowledge of what you are selling are the essential features to interest your customer. Perhaps the following will serve in helping you to place our proposition tersely.

First—

Economy
- In the consumption of composition.
- In the saving of buffs.
- In the saving of the buffers' time.
- Increased production.
- In the saving of power.
- Decreased wear on belts, lathes and machinery.
- In the cleaning of the buffed parts.
- Man power.
- Fuel.

1. The first saving—you know our method of showing a decrease in the consumption of composition.

2. The saving in the use of buffs. Let us Hooverize. A saving of at least ten per cent. in buffs means what? That in the actual cost of the buff, based on present prices, about five cents on each section of buff used. More than that—for every ten new wheels that the operator uses with low-grade compositions he will use only nine with our high-grade composition. How long does it take the average buffer to set up and rag out and balance a new buff? Ten minutes, one-sixth of an hour. Ten buffers would save what?

3. We have shown by our tests that we save composition and save buffs. The composition that makes this saving requires fewer applications to the wheel. Why? It adheres to the wheel longer. The composition does the work. The conveyor (the buff) does most of the work when using low-grade compositions. Again let us refer to Mr. Hoover. If the buff, which is not abrasive, does most of the work, the operator must use more pressure; there is more friction; more belt slippage; loss of power; more fuel; increased cost of production.

4. We will be conservative and base our estimates on what we have shown above: Ten per cent. in buffs; ten per cent. in time. We will consider nothing else. Nine men and nine lathes to produce what it takes ten men to produce with low-grade compositions. Labor is scarce; we are attempting to conserve man power; can you offer a better sales argument? You cannot.

5. The cleaning of the buffed parts. High-grade Compositions work cleaner; they are so constructed that the greases yield more readily to the solution in the cleaning tank than do the low grade compositions. To plate or enamel properly the work must be properly cleaned and free from all dirt or greases or the plater or enameler has to do his work all over. Cleaning solutions are expensive, plating anodes run into big money, doing work over is much more expensive than a difference of two or three cents per pound in the price of buffing compositions, therefore to summarize really the cost of the composition is the least thing to be considered, cost of buffs, labor, increased production at a decreased cost, saving of power, fuel and machinery.

Now, your greatest and clinching argument is that you are ready to go into the buyer's plant and show him without any expense or obligation on his part.

In your statements make no rash claims, be conservative, but be convincing, you are not selling gold bricks, do not make a statement that you are not ready to back up, and at the time you make it. Last but not least. This is not theory but backed by actual tests.

LOSS OF HEAT BY RADIATION

By S. L. Barnes, Armstrong Cork Company, Pittsburgh, Pa.

Quite a unique test for determining loss of heat by radiation from boiler settings and steam drums has been run by Mr. C. A. Eastwood, superintendent of Station A, Pacific Gas and Electric Company, San Francisco, Cal. For his experiment Mr. Eastwood selected a 560 h. p. B. & W. boiler, the steam drums of which were covered with one course of common brick. A rectangular can containing a measured quantity of water was placed on top of one drum and the boiler was run at its rated capacity for a period of three days. During this time the rise in temperature of the water was carefully noted, and with these data it was a comparatively simple matter to determine: (a) the amount of heat radiated per square foot of surface per hour; (b) the amount of heat radiated from the total exposed area of the drums; and (c) the quantity of fuel which was being burned to make up for this loss. Mr. Eastwood's figures showed that the loss totaled 390 barrels of oil per year.

To determine how much of this fuel-loss could be saved by the use of an effective heat insulating material, one 2½-inch course of Nonpareil Insulating Brick, manufactured by the Armstrong Cork & Insulation Company, Pittsburgh, Pa., was then placed on top of the common brick covering, and readings were taken as in preceding tests. The result showed that with the Nonpareil Insulating Brick in place the loss of heat amounted to only 144 barrels of oil per year—a saving of 246 barrels, or 63 per cent. With oil costing only 70 cents per barrel, the saving amounted to $172.20 per year—more than enough to pay for the cost of the insulating brick and the labor required for installing them.

In considering these figures, there are two points in connection with them that should not be overlooked: First, the total amount of heat lost represents that radiated from the steam drums alone; second, only 2½ inches of Nonpareil Brick were used. Had the radiation from the exposed boiler walls been included as well, the total heat-loss would have been greatly increased. Furthermore, if the common brick had been removed entirely and replaced with a course of Nonpareil Brick set on edge, giving 4½ inches of insulation instead of 2½ inches, a still greater saving would have been effected, since, according to tests, Nonpareil Brick are ten times better heat insulators than either common brick or fire brick.

CONDITIONS IN BUFFING WHEEL MARKET

By B. H. Divine, Divine Brothers Company, Utica. N. Y.

Raw cotton is between 32c. and 33c. per pound, the highest since the Civil War, and it will go still higher unless the Government steps in and sets a maximum price on it. This high price is, of course, directly reflected in the price of cotton goods used in the manufacture of buffing wheels, and the reflection is intensified by the abnormal demand for all kinds of woven cotton goods, due not only to the natural market, but also to the enormous orders placed by the Government of which the public are not advised.

One grade of goods very popular in buffs is today 17c. a yard, when previous to the war in normal times the price was from 6c. to 6½c. per yard, and this condition also prevails in other grades of goods used for buffs.

On sewed buffs the situation is much more complicated, due to the fact that materials from which sewed buffs are made are what might be called by-products and have no standard market value. It has been customary for cotton mills which are the source of supply for this material to put out bids the first of the year, selling to the highest bidder on a contract for the calendar year, but this procedure has been almost entirely discontinued this year, due to the fact that other lines of trade than buffing-wheel makers have come into this market and have use for this material which enables them to offer very high prices for it, such as classes of trade where it is cut into small pieces in manufactured articles in place of using full-pieced goods.

The producers of this material not being willing to contract makes the supply of this buff stock extremely uncertain, and manufacturers of buffs will no doubt find themselves unable to accept business for future delivery on contracts as has been the

custom and will have to confine themselves to day-by-day sales for immediate delivery.

These are the reasons why the buff user will be unable to ask for and get the price on buffs which will hold open longer than the limited time necessary to get an immediate reply back to the seller, and the seller is also warranted when making a price in attaching a stipulation that the price offered must be subject to change without notice, for he must go into the market and cover himself on his material, which may have jumped in price over night since he made his offer.

The possibility of the Government making a fixed price on cotton, of course, prevents the buff maker from carrying a large stock of material on hand and covering thereby his quotation to the user. The buff manufacturers, especially the older and larger concerns, are doing everything to protect their trade and conserve the supply of materials for the benefit of the users.

READY-DESIGNED SWITCHBOARD

There are many power-station operators today who still remember the time when electrical power was in its infancy—the time when controlling devices were so inadequate that the "knife-switch" opened with a flaming arc in trail—an arc which was then beaten out with a leather thong. In those days it became evident to many that electricity must be better controlled if its best promises were to be fulfilled. Inventive genius was set to work to produce improved devices for the control of every sort of current, and in time the modern switchboard was evolved.

After the slate or marble panel, with its controlling and measuring instruments and its tripping devices for opening circuits at a sign of danger, was firmly established, a need for a uniformity in material, size and equipment became evident. However, it was thought by many that a complete standardization, such as had revolutionized industries and trades, would be impossible in switchboard manufacture.

But the switchboard specialists of the General Electric Company, Schenectady, N. Y., saw things in a different light. To substantiate their views they had the experience of thousands and thousands of cases which showed conclusively that most control needs fell into distinct classes whose requirements could be met by standardized material. Thus it happened that there was developed a complete classification of switchboard needs together with a standardization of the apparatus manufactured to meet these needs. Panels became units and thousands of them, after being described and assigned catalogue numbers, were listed in books covering many phases of the electrical industry.

Today it is possible for station owners and users of electrical power to order switchboards of a great many sizes and capacities directly from a cttalogue. Much of the worry, delay and expense of specifications and drawings has been eliminated and in its place stand the advantage of quantity production and concentrated skill in design. Of course, various cases still exist which require individual switchboard engineering, but a great many switchboard conditions may be met by these "Standard Unit" Panels. Because of this and because of the saving in time, trouble and money which results from their use, "Standard Unit" Panels are said by some engineers to be one of the greatest advances in the switchboard engineering of recent years.

GOVERNMENT COMMANDEERS WATROUS GALVANIZING PROCESS

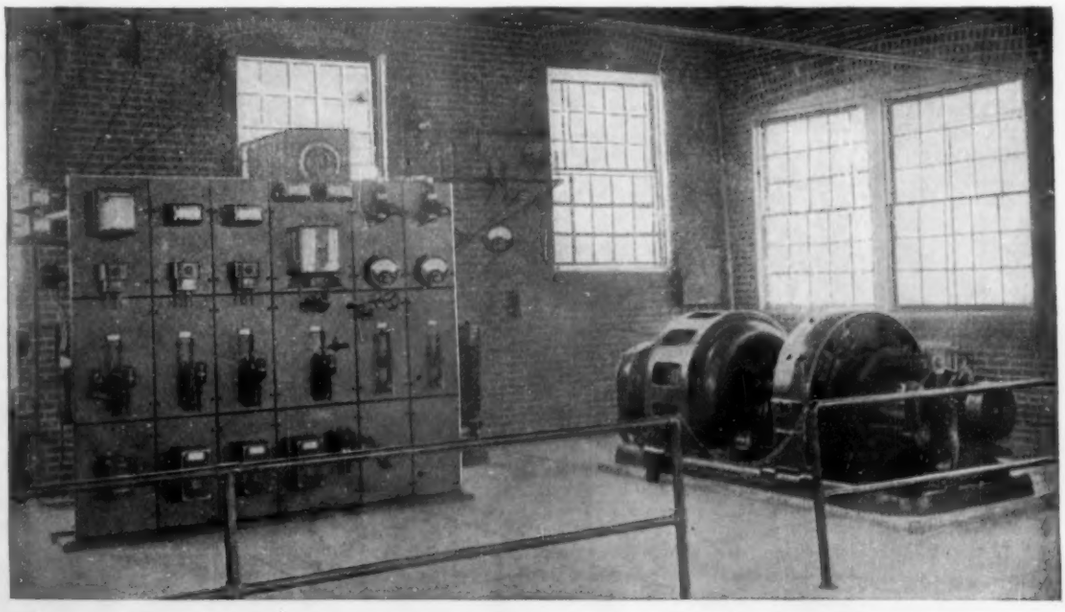
Last September the E. L. Watrous Galvanizing Company of Des Moines, Ia., whose advertisement appears upon page 63 of this issue, sent some samples of their work and description of their process to the Navy Department at Washington. The samples were duly tested and approved and the government requested prices and terms.

The company has a standard royalty contract which all its licensees are required to sign, and which stipulates that all contracts must be uniform and that no favors shall be granted to one licensee that are not granted to all the rest.

The government objected to some clauses of the contract, but the company took the stand that it was bound by outstanding contracts with its present licensees, several of whom are now working on war contracts with these machines. A lengthy correspondence ensued which was on the first of the month cut short by a peremptory order from the government to the company to deliver the machines immediately in precedence of all other business, "Terms to be agreed upon later." The company had one machine practically completed for another customer, but that was promptly diverted and went forward by express, despite its weight of 1,100 pounds to "Somewhere in the East."

It is understood that the differences are largely a matter of form and an equitable settlement will undoubtedly be made. This step relieves the company of the responsibility of maintaining the letter of its contracts, so far as the government is concerned.

The Watrous galvanizing apparatus and system were described in THE METAL INDUSTRY for September, 1917.



READY DESIGNED SWITCHBOARD PANELS FOR THE CONTROL OF ELECTRICITY.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN INSTITUTE OF METALS

President W. M. Corse has the following to say about the Society for the past year:

"The Eleventh Annual Meeting of the American Institute of Metals was held in Boston, September 24 to 28, 1917, and was one of the best in the history of the institute. The program was unusually good and the discussions were very interesting. The first issue of the new journal made its appearance at that time and created a very favorable impression. Numbers 1 and 2 of the journal certainly show a high grade of our publications. The improvement in the quality of the papers and of the illustrations is quite noticeable and stamps the journal as being strictly first-class. The fact that our members receive four issues a year keeps them in better touch with what is going on and we believe the change from the yearly volume to the quarterly issue has met with approval. Dr. Paul D. Merica of the Bureau of Standards is editor of the journal and his appointment to this office guarantees the quality of the articles which will appear.

"The membership of the institute is steadily increasing and the Corporation Membership is being taken advantage of by a number of different concerns. This Corporation Membership entitles a concern to have the benefit of three active memberships at a reduction of 20 per cent. in price. We have about 30 corporation members at the present time and a total membership of approximately 350. The fact that the American Institute of Metals devotes its entire attention to non-ferrous alloys has drawn to its membership most of the leading alloy metallurgists of the country.

"Many of the members of the American Institute of Metals are actively co-operating with the Government on specifications and in the actual production of bronze castings and alloys for Govermental purposes.

The bettering of the quality of its publications, both as regarding their contents and appearance, should further increase the interest and number of members. Anyone interested in non-ferrous metallurgy in any of its phases should not fail to take adantage of the privileges to be secured by a membership in the American Institute of Metals."

AMERICAN ELECTRO-PLATERS' SOCIETY

Oscar E. Servis, supreme secretary, reports that the past year affected this Society like many other organizations in new members, while there has been a steady increase, it has not compared with the previous year. This is accredited to the uncertain or unstable conditions of industrial activities, occasioned by the war, many firms discontinuing the manufacture of certain articles, due to the high cost of materials, and the uncertainty of securing same, have entered into the production of ammunition or war materials, in which the plater takes no particular part except in a few instances.

Like all crafts or occupations many of our members have been called to serve the cause of democracy and the Society is carrying them on the roster in good standing.

The main event of the year was the annual convention held in St. Louis, Mo., which eclipsed all previous conventions. Many papers worthy of note were presented, and a keen interest was displayed in the discussions of these papers.

It is expected that the Educational Bureau will begin a series of educational activities shortly, which are looked forward to with enthusiasm.

Undoubtedly applications for 1918 will be increased, as the manufacturer or employer is fast becoming acquainted with the value of the American Electro-Platers' Society to his foreman plater and urging his membership. Many firms are availing themselves of the Employment Department, in securing capable men for positions.

The Society is desirous of reaching every plater who is not as yet a member, and interest him in the advantage of membership.

New York Branch—Meets second and fourth Fridays of each month at 32 Union Square. Thomas Haddow, president, and William Fischer, 300 St. Ann's avenue, New York, secretary.

The annual banquet of this branch will be held February 23, 1918, at 7:30 sharp, at the Broadway Central Hotel, Broadway, near Fourth street, New York.

Manufacturers are cordially invited to attend this annual banquet, together with their managers, superintendents, foremen, platers and chemists. An especially attractive program has been prepared for the occasion and well-known speakers have consented to give addresses on various subjects of interest. Manufacturers and dealers in plating supplies are urged to reserve exhibition space at once, and application for space at a fee of $10.00 should be addressed to William J. Schneider, chairman of the Banquet Committee, Broadway Central Hotel, New York.

Tickets for the banquet are $2.00 each and can be had from William Fischer at the above address or from any member of the branch.

NATIONAL ASSOCIATION OF BRASS MANUFACTURERS

Commissioner William M. Webster states that the National Association of Brass Manufacturers has accomplished much during the present year, in the matter of standardization of brass goods and the elimination of unused and obsolete sizes as they find there is a general movement on foot in all lines of industry, to minimize the cost of production, the conservation of effort and resources in the process of producing goods, even unto the matter of dispensing with unnecessary effort in the execution of ordinary factory and office business, all of which saves labor and effort and sends it through productive channels.

The association also has lent its efforts in every way possible, to the mobilization of goods and obtaining speedy results in securing materials for cantonment and war purposes and many of our people are now engaged in producing materials for our government.

It has also gone into the standardization of catalogs, to make them more helpful and useful and we hope during the coming year to accomplish many things which will be not only helpful to the industry, but to our nation in its present struggle.

At the annual meeting held in New York the fore part of this month, a War Service Committee was appointed, consisting of Commissioner Webster with Messrs. Mueller and Hale, which committee was created for the purpose of doing what we can to assist the government wherever possible.

Indications are that the government price of copper will hold around about the 23½ cent mark and while in the arts and commerce, the consumption has been materially reduced, we must not lose sight of the fact that the government consumption will be great. While it is believed the copper production for 1917 will equal or exceed that of 1916, it is equally true that imports from South America show an increase of in the neighborhood of 60,000,000 pounds and there are reasons to believe much less copper will be produced in this country. It is also estimated that losses due to strikes and other troubles in the past season particularly in the Western District, will run up to 100,000,000 pounds and some incline to double that figure. Those who seem to be versed, incline to the belief that the loss in that direction will more than double the South American imports.

For industrial purposes and general business conditions in the plumbing line, that will largely depend on building conditions, which, in consequence of chaotic conditions, is at this writing very problematical.

METAL DECORATORS' ASSOCIATION

This association has been recently organized with the purpose of keeping in touch with legislation directly or indirectly affecting the metal decorating industry; to exchange ideas on manufacturing, decorating, selling and purchasing; to correct trade abuses; to co-operate with the government on matters of interest to metal decorators; and in general, to uplift the metal decorating industry. The members include the American Metal Cap Company, Brooklyn, N. Y.; Passaic Metal Ware Co., Passaic, N. J.; Phoenix Hermetic Company, Chicago, Ill.; The Heekin Can Company, Cincinnati, Ohio; Decorated Metal Manufacturing Company, Brooklyn, N. Y.; Leo Schlesinger Company, New York; American Art Sign Company, Brooklyn, N. Y.; Metal Lithographing Company, Brooklyn, N. Y.; National Metal Coating & Litho Company, Elizabeth, N. J.; Metal Package Company, Brooklyn, N. Y.; Moncrief-Lenoir Manufacturing Company, Houston, Texas; Acme Metal Decorating Company, Brooklyn, N. Y.; Edgar Metal Decorating Company, Brooklyn, N. Y.; and The Tinplate Decorating Company, Brooklyn, and after the present Membership Campaign is concluded, it is expected that every metal decorator in the United States of any repute will be a member.

NATIONAL MACHINE TOOL BUILDERS' ASS'N

Charles E. Hildreth, general manager, states that the National Machine Tool Builders' Association has endeavored during the past year to assist the government in all ways possible, appointing a special committee in early February, 1917, to co-operate with the War Industries Board for special information regarding machine tools available in this country for the government and their allies. This committee has worked with the War Industries Board throughout the year and during the latter part has been in close touch with the Finished Products Division of that Board.

We plan to continue this same policy of co-operating in every way possible with our government in its needs for promulgating the war.

METAL FINISHERS' EQUIPMENT ASS'N

The Metal Finishers' Equipment Association has been organized with the following officers for 1918: President, B. H. Divine, Divine Bros. Company, Utica, N. Y.; vice-president, H. L. Zucker; treasurer, P. W. Ellwanger of the Matchless Metal Polish Company, New York, and secretary, Franz Neilson.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST

Harry W. Goddard has been elected president of the Connecticut Brass and Manufacturing Corporation, Waterbury, Conn., to take the place of John E. Liggett who resigned to become chairman of the Board of Directors.

J. D. Fry, formerly of the Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa., has become a member of the firm of The Rider-Bagg Company, Springfield, Mass., and has been appointed general superintendent of this company.

F. P. Welton, formerly with the Naugatuck Valley Crucible Company, Derby, Conn., has become connected with the Jonathan Bartley Crucible Company of Trenton, N. J., and will represent that company in the sale of their crucibles and retorts throughout New England and Canada.

Charles T. Bragg has accepted the position of works manager with the Michigan Smelting & Refining Company at its Detroit, Mich., plant. Mr. Bragg was formerly connected with the Ohio Brass Company of Mansfield, Ohio, for six years in the capacity of chemical engineer and for four years was technical director of Berry Brothers of Detroit, Mich.

George A. Lautz, president of the Niagara Machine and Tool Works, Buffalo, N. Y., will discontinue his active and financial connection with that firm about the end of February. Mr. Lautz has been president of this company for ten years and previously was general manager for 27 years. He expects to take a much needed rest and has not formulated any plans for the future.

J. C. Bannister has been made a vice-president of the Walworth Manufacturing Company at Boston, Mass., manufacturers of iron fittings, valves, Stillson wrenches, etc. Mr. Bannister has been connected with the manufacture of this type of product for twenty-six years, starting as foreman of the tapping department of Haxter Steam Heater Company at Kewanee, Ill., in 1891. He advanced successively to superintendent of pipe finishing mill, and chief engineer. For three years superintendent of Kewanee Boiler Company when National Tube Company took over the operation of Kewanee Plant, Mr. Bannister was made manager of Kewanee works. Walworth Manufacturing Company then purchased Kewanee works in August, 1917, and Mr. Bannister has now been made a vice-president of that company although his headquarters will still be at Kewanee, Ill., and no change in the management there is at present contemplated.

DEATH

EDWIN J. KEANE

The metal trades will regret to hear of the death of Edwin J. Keane, secretary of the old firm of Hendricks Brothers, 49 Cliff street, New York, proprietors of the Belleville Copper Rolling Mills, Belleville, N. J.

Mr. Keane was born in New York in February 28, 1870, and was educated at Grammar School No. 35, and in 1883 he entered the employment of Hendricks Brothers as office boy and held successive positions until the firm was incorporated when he was made secretary and treasurer of the corporation.

EDWIN J. KEANE.

He was very well known and respected in the metal industries, was a member of the New York Metal Exchange since 1892, and at the time of his death was one of the members of the Tin Committee.

Besides his business activities Mr. Keane was an original member of the New York Naval Reserve and was a member of the New York Athletic Club since 1891, taking an active part with the rowing crews of that organization. In 1893 he rowed stroke on the so-called "Bantam Crew," which was famous for having won three races in one day. As an oarsman, he won many other prizes under the colors of the New York Athletic Club.

Mr. Keane is surived by his father, two brothers and a sister.

METAL MEN IN THE SERVICE OF THE ALLIES

(THE METAL INDUSTRY published in May and June, 1917, portraits and positions of the members of Government Metals Committee.)

Major White, Treasurer Richards & Co., Boston, Mass., one of the oldest metal firms in the United States.

Lieut.-Colonel D. Bates, Bates & Peard Annealing Furnace Co. Served a year in the trenches, 1916-1917, and now on reserve list due to age limit.

Anthony Mamquet, Foreman Electro-Plater. Royal Flying Squadron, Canada, now in France.

Captain De Courcy B. **Browne,** Metallurgical Engineer, Goldschmidt Thermit Co., New York City, now with the Engineers in **France.**

Joseph Haas, Foreman Electro-Plater. Engineers Corps, Camp Upton, L. I.

First Lieutenant Harlowe Hardinge, Hardinge Conical Mill Co., New York City. Signal Enlisted Reserve Corps now in France.

Philip J. Sievering, General Manager of Philip Sievering Plating Works, New York City. Aviation Section, Signal Officers Reserve Corps.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

JANUARY 7, 1918.

Turning its back on one of the most remarkable years of its history, industrially, Waterbury is stepping forward with 1918 conscious of a condition which is pregnant with circumstances that may make or mar industries and business plans, but full of confidence in its ability to cope with the situations that may arise and alert to the signs of the times.

To review 1917 is an undertaking that requires much time and space, even if one considers only the metal industries, but in general the progress of these industries, at least throughout the Naugatuck valley, may be said to have been extremely gratifying. Growth has been rapid, but also healthful. Great obstacles have arisen, have been faced and surmounted, though to represent the results as altogether felicitous would be erroneous. Expansion has been marked in large and small industrial organizations. Profits have been satisfactory. Wages and the profits of wage earners have been satisfactory, even when the abnormally high prices of commodities have been considered. Labor conditions have been generally peaceful. Supplies of materials have come along about as well as could be expected and orders have been sufficient in most lines of business to keep payrolls at their normal war strength, if not better. These, in general, are the outstanding features of the situation in the metal industries here and throughout the Naugatuck valley during the past year. The background, of course, is the somber, impressive, steadying haze which is the consciousness that a world war is directly or indirectly responsible for almost every condition and circumstance of importance in the management of such industries.

While Waterbury's largest factories have profited much by orders for goods which are in great demand on account of the war, there has been a very healthful demand for other goods which are common products in peaceful times and which are in demand chiefly within the nations not engaged in war. Pins, rods, flat brass, metal novelties, watches, metal wares for hardware production, brass goods for electrical fixtures and equipment, cutlery, materials used in the production of jewelry, lamps, containers and similar products, have enjoyed an unusually good demand, comparatively speaking, and this has made it possible to keep factories and departments which produce these wares running full time practically all the year. The workers engaged in these lines have not enjoyed wages like those of other workers who produce materials demanded by munitions makers and consumers, but they have at least had full time and scales of wages better than those of antebellum days. Even the vacation seasons and the holiday shutdowns of Yuletide were dispensed with in most plants because there was work to be done that could not wait. Not every factory has been able to keep its maximum force employed the year around, but a majority of the plants here have been full time and none too many hands throughout the year.

Labor shortage has been a serious handicap in some respects. The chief effect has been to inflate the wages of workers who are unreliable and the next serious effect has been to overburden the willing and dependable workers. Employers and employees alike are in the latter class and it is apparent to all who have been close to the situation that the strain has told heavily on those subjected to the drive for production. Young men have found that with advanced positions and greatly increased responsibilities and remuneration, there has come also an increased tension which is just as surely shortening their lives as is the work of the men in the trenches and aboard the submarine chasers. Still more have the heads of these busy and ever-expanding Naugatuck valley concerns found themselves absorbed, not alone with the all sufficient burdens of their business, but also with the insistent and irrepressible demands of local, state and national government undertakings for their advice, their time and their constant attention. Labor shortage has resulted in an overloading of those who have been willing burden bearers and who have been reluctant to complain when the country needs service so badly.

It has also resulted in a situation among employees which is dangerous and must have study and attention to the end that it may be removed before it becomes a pronounced evil.

Conscious of this, Waterbury's industrial leaders have spent much time and money during the past year to improve the conditions of their workers. Various undertakings within the factories have been launched to the end that the workers may have proper entertainment, relaxation and care, while extensive plans have been made for the proper housing of employees and their families within the city. During the year some 466 dwellings have been erected, over ninety per cent. of them for employees of the larger manufacturing plants, and still the work goes on. In co-operation with the city and the state steps have been taken to interest the authorities in the efforts of some landlords to demand excessive rents. Insurance of employees, pension plans and similar arrangements making for the improvement of conditions for the employee have been undertaken in various large manufacturing concerns. Families of men drafted or called into service because of their connection with the National Guard, campaigns for the betterment of the conditions surrounding the soldier and the sailor in the field, and his family and dependents at home, besides the general improvement of conditions locally for the benefit of the factory worker have engaged the attention and interest of all progressive employers here.

Early in the year, before the war, much interest was taken in the local Red Cross chapter and a local campaign increased its size considerably, but just before Christmas this year the national campaign had the full attention of several plants and the result was a high percentage of factory workers enrolled as members of Waterbury chapter. In this connection Thomaston, Torrington and Winsted also made good showings, but Thomaston probably has the best record, having closed the week with a membership of nearly 1,000. Waterbury's membership now is 30,000 and out of the new memberships estimated at about 24,000 metal producers and factory workers comprise over 50 per cent. One of the factories of the Chase Companies, Inc., gave practically 100 per cent. of its employees, another reporting 80 per cent. enrolled.

One of the most important changes of the year was due to the entrance of the country into the war and the drafting of its young men. With the departure of the National Guard about 500 skilled men went out of the ranks of the metal industries. Twice as many went one by one to join the army or the navy or to don the uniform of some other country engaged in the war. Then came the draft, which has taken some 1,200 men out of the city, nearly all of them factory men from the ranks of the unskilled laborer and all others, including the chairs in the executive offices. Then there was a more important loss of men of responsible positions whose expert services were demanded in some government office.

Women have begun to fill the places of drafted men and there are indications that this year will see a rapid increase in the numbers of women employed in factory departments seldom open to female labor in the past.

In manufacturing corporations there were a few changes during the year. Harris Whittemore and Royal Victor began terms as directors of the American Brass Company last January. This corporation bought forty acres of land near its present local plants to hold for future development and has developed its Buffalo office considerably while constantly enlarging its local, Torrington and Ansonia plants. Its annual meeting, this month, is expected to produce reports of marked progress.

The Scovill Manufacturing Company has had some 13,000 employees on its payroll throughout the year, although there was a slump or two of serious proportions for brief periods, and it is still enlarging its splendid plants. Three large new factory buildings are now in the works while contractors are completing operations on several buildings started late in the summer. With a splendid new laboratory, thoroughly modern buildings and equipment in every department and a highly developed system of operation and policing, this institution holds a front rank among the great plants of the country which have been greatly affected by the war.

The Chase Companies, Inc., with their plants at the north end of the old city and in Waterville, have witnessed steady and healthful growth, and, while the size of their forces has been considerably reduced during the past two months, they also have closed a most remarkable year for growth and business.

One may go through the roster of the 130 manufacturing plants here and much the same story is to be heard. One finds some changes have occurred. The Pilling Brass Company has been sold to the Connecticut Brass Corporation. The Waterbury Clock Company has added glass making to its accomplishments and produces watch and clock crystals for its own use. Frederick W. Nettleton has left the Waterbury Clock Company to engage in business in Bristol, and in his place is C. Harold Granger. J. Russell Putnam has been made mechanical superintendent of that company. George A. Goss is in France as an ordnance officer of the United States army, having left the Scovill Manufacturing Company to take a commission as captain, and hardly a manufacturing corporation here is without a service flag that includes stars representing sons of the principal officers.

Looking forward one finds that there are indications of excellent business for an indefinite period. At the same time there is felt a certain amount of uncertainty owing to the dependence of much of the work now done here on war orders, and this accounts for what may be called an extremely conservative attitude on the part of employers. Practically every line of the metal-producing business is active and orders good, but fuel shortage, lack of material and labor scarcity tend to keep gray heads worrying and make it impossible to forecast the work of the year with reasonable accuracy.—T. F. B.

BRIDGEPORT, CONN.

JANUARY 7, 1918.

A review of the year here in Bridgeport of concerns which deal in metal is practically a review of the year for the whole of the city. While there are probably several concerns in the city which do not use metal of some kind or other in the manufacturing of their articles these are not of enough prominence, with one or two exceptions, to come before the public notice. Bridgeport has for some time been known as the Essen of America, and this is rightly so. It is estimated that more war material is made here in Bridgeport than in any other city in the United States. War material means in almost every case metal so it can easily be seen that Bridgeport is a metal city first, foremost and all the time.

Prosperity, spelled with a capital P, has been the keynote of business here for the last year. Without scarcely one exception there is not a factory in the city that has not made magnificent profits during the year of 1917. Naturally some factories have increased their earnings vastly over others, but averaging all of them up it can safely be stated that the past year has been a most successful one for Bridgeport.

Before the entrance of the United States into the World War the factories here were loaded with orders from foreign governments and since the United States ranged itself alongside the Allies our own government orders have largely supplanted those of foreign powers. Even at the present time the Remington Arms Company, one of the largest concerns in the city and the employer of many thousands of helpers, has shut down for a short space of time in order to remodel the factory to fit it for the manufacturing of the Browning gun for the government. The factory has heretofore manufactured bayonets of all kinds and guns for several of the different nations engaged in the war. Other war materials were also made, but the bayonets and guns were the main output. Needless to say in a factory turning out material such as the above mentioned there was ample room for metal workers of all kinds—polishers, forge-men, filers, annealers, barrel straighteners, mill operators, screw machine hands, in fact every branch of mechanic known to modern manufacture found a place within the limits of the Remington Arms.

While some of the workmen thrown out of work for a short space of time by the closing of the Arms view the situation with alarm still it is stated on the best of authority that when the Arms resumes operation on January 2 there will be room for about 6,000 more employees than have heretofore been enrolled on their pay list. There is some talk that the United States government will take over the operation of the company, but this idea is scouted by those who are closely in touch with affairs at the plant.

So much for the Arms. Next comes its sister establishment, the Union Metallic Cartridge Company, under the same general head as the Arms company, but having a set of executives all its own. Orders here, where shells and cartridges of all kinds are made, are pouring in and there has been practically no let-up in the rush that started over a year and a half ago. Contracts as yet unfilled in entirety are keeping the plant running full speed and additional contracts have been secured and are being secured every day which will provide sufficient work for the U. M. C. for over a year or two more. Brass, in all its forms and undergoing every conceivable turn of manufacturing, is, of course, the big metal at the U. M. C. Men who have worked in brass factories in other cities find themselves immediately at home here.

Of almost the same importance in the brass trade as the Union Metallic Company, if not altogether its equal, is the Bridgeport Brass Company. Brass is again naturally the important metal here, and in this factory it goes through even more operations than at the U. M. C. Brass wire of all sorts and thicknesses and for all purposes, from the heavy overhead trolley wires made of a brass-bronze combination to the small springs used in watches, are turned out by this company. No order is too big or too little for this company to take care of and consequently they, as well as the other factories of the city, have their share of government work and that of the Allied governments as well.

Other brass and metal concerns, the Bridgeport Bronze Company, the Artistic Bronze Company, the Monumental Bronze Company, the American Tube and Stamping Company, the American Chain Company, the Sprague Meter Company, the Bridgeport Metal Goods Company, the Crane Valve Company, the Harvey Hubbel Company, the American and British Company, the Liberty Ordnance Company, every company in the city dealing with metal of any description whatever has had a successful year, so successful in fact that space will not permit a detailed description of the business of each one.

The silver companies, of which there are quite a few in the city, as well as the plating concerns have also had a good year. Labor conditions, which at the beginning of the year were the cause of no little trouble, have all been straightened out and are now in first class order.

The silver companies without exception report a successful year. The Newfield Silver Company, the E. H. H. Smith Company, the International Silver Company, all report more business during the last year than at almost any time since their organization. Several of the firms have found it necessary to enlarge their plants so great has the quantity of their business increased during the last twelve months. To sum it all up, Bridgeport business, which means practically metal business, has been at a higher level during the year of 1917 than at any previous time in its history and there is not a factory of any prominence in the city which has not realized its proportionate share of this increase.

As to the future, optimism is the watchword. Here and there, at very frequent intervals may be found a "doubting Thomas," but the vast majority of the business men of this city look for the year of 1918 to produce fully as much if not more business than the past year has done. Labor trouble, that is a scarcity of labor, may trouble the factories here to a certain extent but so far the situation is all serene. There are a great number of Hungarians at present in the city and if these are prohibited from remaining in the employ of factories doing Government work the situation may then become a trifle extreme, but it is supposed by those in authority that these men will be allowed to retain their positions.

While the draft has hit this city about as hard as any other manufacturing one, still its inroads are not appreciably felt in the factories as yet and the owners and managers are extremely optimistic over the outlook for the coming year. Government contracts are still coming into the city in quite large numbers and there is no reason to suppose that these will cease with the dawn of 1918. The head of every concern interviewed by the writer has stated in no uncertain terms that he regards the coming year fully as promising as the past year has been and, when the great financial strides made in Bridgeport during 1917 are taken into consideration, this statement amounts to something important. The coming year will in all probability find Bridgeport larger, richer, and financially greater than at any time in its industrial career. L. M. P.

NEW BRITAIN, CONN.

JANUARY 7, 1918.

Unaffected, apparently, by the great shortage of coal that is everywhere manifest, the metal manufacturing concerns of New

Britain are continuing their even tenor through an era of industrial activity that bids fair to continue through the New Year, through the duration of the war and into the seemingly remote times of peace for which all pray. Today the various hardware specialty concerns in this city are more firmly established than they have ever been before. Business in every instance is fair and in many cases it is excellent. Every factory is working on a full schedule and not a few are working overtime, while at least one is working both a night and day shift. Because of the numerous war orders, government contracts and sub contracts that are held by local companies it is not expected that the war will cause any appreciable lull in business during the ensuing year, and when peace ultimately arrives the nature of all the factories here is such that they can even better cope with the vast orders for builders' hardware that must perforce come in the period of the old world reconstruction.

Briefly, those doing the most in war business are the Landers, Frary & Clark Manufacturing Company, the New Britain Machine Company, the Stanley Works, the North & Judd and the Traut & Hine Manufacturing Companies and the American Hosiery Company. Among other things the Landers, Frary & Clark Manufacturing Company is making rifle bayonets and army knives. Both the North & Judd Manufacturing Company and Traut & Hine are employed in making regulation army uniform buttons, snaps, clasps, buckles and other accoutrement. In addition to making mounts for anti-air craft guns the New Britain Machine Company is turning out a great number of machines used by other concerns. All of these aformentioned concerns are working overtime in various departments, while the last named operates both day and night. The Union Manufacturing Company is also unusually busy and in some departments operates overtime. There was a report current in business and manufacturing circles to the effect that the North & Judd Manufacturing company had been asked by the United States Government to reserve all its capacity for government orders and also to take no further outside business for the present. Frederick M. Holmes, assistant treasurer of the concern, denies this absolutely, however. Although not officially given out, it is understood that the business being done by this concern is of such a volume that the present capital of $1,500,000 is being turned over three times per year.

To keep pace with its industrial growth the Landers, Frary & Clark Company is already beginning plans for the erection of two new buildings. One will be of brick, three stories high, will be used for manufacturing purposes and will cost $35,000. The other will be of a single story and will cost $3,000. Charles F. Smith, president of the above mentioned concern, has just resigned from the office of first vice president of the American Hardware Corporation, but will continue to remain on the board of directors. Charles Glover, who succeeds him, has been connected with this concern and its predecessors for over forty years.

While the orders on the books of the Bristol Brass Company are enormous it is reported that this concern is badly handicapped by a lack of available material with which to work. As a result a number of employees have been temporarily laid off. This concern also, is one of those which aims to employ no alien enemies and on the eve of the declaration of war on Austria upwards of 50 Austrian employees, who had never been naturalized, were given their wages and advised to keep away.—H. R. J.

HARTFORD, CONN.

JANUARY 7, 1918.

The year just closed has brought a big business boom to Hartford, especially to the factories of the city engaged in manufacturing munitions and military and naval supplies for the government. Many of the factories are devoting the whole output of their large plants to this work. Practically all of the larger metal establishments of the city are working on war contracts, some directly, and some indirectly.

Hartford has had a great business boom since the beginning of the great European strife, which was added to the past year by the entrance of the United States in the Great War. The factories have been handicapped throughout by the congestion of the freights, which caused worry concerning the raw materials. They have not been able to engage the necessary amount of men. Many of the men employed in places working almost exclusively on war contracts, have voluntarily enlisted in the service of the country, while another large number were taken by the selective draft. Many of the men who were drafted and assigned to cantonments have since been released from military duty to be put to work in the munition factories of the city, where it was felt that they could be of more service to the country.

The population of the city has greatly increased, mostly through the places offered in the factories, and the attractive wages.

Strikes have been few during the year, although there were several in the shops, most of them minor affairs. The factory heads have met any situation which looked as though the output of their plants would be affected.

The great increase in the factory building is shown by the large number of building permits issued each week. The amount expended in new equipment and plants goes far into the hundreds of thousands of dollars. A few small metal manufacturies have sprung up and are rapidly developing.

The prosperity of the plants is shown by the fact that many of them have found it advisable to give bonuses to their employees, who work harder to help get out an extra quantity of goods.

Many of the factories, notably the Underwood and Royal Typewriter Company shops, were hard hit when war was declared by Germany, when their great foreign trade was shattered for a time. Both factories are now running overtime, and both have built, and are now building, additions. There is a good outlook for the present year.

The coal situation has begun to worry the local manufacturers, although none of the plants have been required to cease business operations, as has been the case in other cities. The plants have had enough to tide them over, and none of the places have a large reserve supply. A severe snowstorm, which would stop the movement of freight, would cripple the output of the plants, it is asserted.

The Meriden, Conn., branch of the Colt Patent Fire Arms Manufacturing Company of Hartford is being equipped as fast as possible to take care of the manufacture of Browning machine guns for the army. The plant was formerly a part of the New England Westinghouse organization, which has closed because of the cancelling of orders from the Russian government. The Colt company equipped the branch last spring and the place has been in continuous operation since that time. Until present contracts are filled, work on the machine guns will not be started. The guns will be made in both the Meriden and Hartford plants. P. B. D. S.

BOSTON, MASS.

JANUARY 7, 1918.

Business throughout the year 1917, generally speaking, has been exceptionally good, although it must be said that a few of the smaller foundries and other industrial plants have at times experienced some difficulty in maintaining production. On the whole, however, everybody has been busy. Occasionally there have been cases where large concerns have had to let groups of men go owing to the difficulty in securing material.

The labor situation has been a perplexing one, and in many cases it has been hard to obtain necessary men. The starting up of the government war plant has made a great drain upon man power, and it is feared that the shortage will be considerably increased in the near future. In this respect the question of female labor enters into the question, and it is noticeable, even in Boston and surroundings, that a number of companies already have introduced a substantial percentage of woman help. Furthermore, it is the general belief that before the present year has advanced very far virtually every foundry and other industrial concern will be employing female labor to a large extent, following, in this direction, the example set by European countries. It is understood that the government has under immediate consideration the question of employing women at the Watertown Arsenal in labor involving light machine assembling and bench work, and no doubt similar steps will soon be taken by private plants.

Despite coal shortage, which in New England is serious beyond expression, and the railroad congestion, production

has been higher than in many years, due, of course, to the war needs of the country. The voluume of the output has been so abnormal that not a few companies of present have practically no stock in reserve, and some factories actually are out looking for contracts, due to the failure to centralize the needs. One factor which has had a salutary effect upon industries in general is the decision of the United States Supreme Court in favor of "open shops." This decision was hailed with great satisfaction by Massachusetts industries, and undoubtedly has greatly facilitated the labor question. It is scarcely necessary to state the coal and material problems are of prime importance, and both have been the source of a great deal of anxiety among industrial men, and steps are being taken by the new management of the railroad to enable the trade to get adequate supplies to New England. At the time of writing public announcement is made that James J. Storrow, head of the New England committee, has obtained the release of a large stock of fuel which already is on its way to Boston and other centers. There is, however, one fly in the ointment, in that a new order has just been issued to the effect that no concern can share in the supply unless it can show that it has not more than two weeks' supply of coal on hand.

The financial outlook for 1918 as viewed by representative financiers is of paramount interest, the keynote of which is that national economy will be essential, that readjustments begun in 1917 will work out satisfactorily, that money will be tight, but that business will be brisk and labor well paid. The industrial situation is fraught with many complex questions. Prosperity beyond the dreams of the most pronounced optimist is chiefly brought about by the great world war. The demand for raw material and labor exceeds the supply, with the usual economic result—an extremely high level of prices for all commodities.—R. T. E.

All branches of the non-ferrous metal manufacturing trades in Boston and surrounding territory are now running with undiminished pressure and capacity to meet the needs of the country and Government at the present time.

The metal manufacturers around here were very conservative and slow to take up this war line of business until this country joined forces with the Allies. It seems certain, as long as the war lasts, and for six months after, that the metal manufacturers will not only have plenty of business but will be taxed to meet the demands made upon them. This means that the different brass foundries which supply castings in brass, bronze and aluminum will be taxed to the limit to meet the demands made upon them.

Ordinarily the general run of business is fair, though not extraordinary. Boston and surrounding districts being a great marine port it has always had its fair proportion of marine business, and at the present time it is away above normal. One of the leading products manufactured here are pressure recording gauges, and they are found distributed all over the world and have done more to keep the name of Boston before the world at large than any product manufactured here.

At the present time the American Gauge & Valve Company, located on Camden street and Railroad avenue, is running its entire plant night and day on this line of goods and have large orders on hand for pressure-recording gauges and measuring instruments which will keep them busy for six months. They have also a special building devoted entirely to the manufacture of parts used on shells and have completed a large order for one of the European governments and are now overhauling their tools and equipment to meet the specifications required before entering on a large contract that has been awarded by the United States Government. They will be all fully equipped to turn out this order in record time from the experience they have had in filling other orders along this line, which will be of great service to them as well as the United States Government.

The Crosby Gauge & Steam Valve Company, located at East Cambridge, is one of the old and reliable brass manufacturing concerns in Boston, and its products have a nation-wide reputation. The company is very busy on marine brass goods and the business conditions for the coming year never looked so promising. During the last six months of 1917 the plant has been running to full capacity.

The manufacturers of soda fountains and fixtures, which consume large quantities of non-ferrous metals are very active for the present time of the year and are hard pressed to secure help owing to the strong inducements that have been offered to the specialists in this line of business to enter other fields.

The Coffin Valve Company, located at Neponset, the concern that manufactures the largest gate and globe valves produced, is specializing at the present time in marine valve work to meet the demand made on it.

The Pneumatic Scale Corporation, located in its modern plant at Norfolk Downs, is very busy on its regular line of goods.

As the coutnry is now down to a real war business, the manufacturing end here is fully prepared to meet all emergencies, and the different manufacturers have taken hold of same with a serious and businesslike spirit, lending all assistance to state and national government. The only situation that seems to interfere at the present time with the output of product is the coal situation, and every one seems to be conserving supplies as far as possible and are quite optimistic over the situation. The demand for skilled mechanics in the allied metal trades is being met by the different trade schools and institutions with any surplus help and these men are filling the positions with remarkable skill.—P. W. B.

ROCHESTER, N. Y.

JANUARY 7, 1918.

With the dawn of a new year the manufacturing interests of this city are looking forward to another season of unexampled prosperity. The past year was one of unusual activity, the value of the total output surpassing even that of 1916 when so many plants were making shells and other war accessories for the Allies.

A great feeling of relief has been brought about by the action of the Administration in taking over control of the railroads during the war. It is the general opinion that in a reasonable time the tremendous freight congestion in Chicago, Pittsburgh and elsewhere along the main avenues of traffic will be relieved and the movement of needed materials greatly enhanced. Labor difficulties, particularly those affecting the railroads, will be ended for the period of the war.

The year of 1917 ends with Rochester metal users in a fairly pleasant frame of mind. Prices were so strong and advancing so rapidly a year ago that nearly all of the larger concerns here bought heavily in all kinds of metals. Copper, brass, aluminum, and zinc were bought and paid for and shipped to Rochester in huge quantites. While the net value of many materials has since receded local dealers and users have felt that their action was not in vain and that even in losing in some ways no shortage of metals has occurred in this city during the past year.

The railroad situation in Rochester has been very satisfactory, all things considered. Shipments of finished products have been regular, and no serious delays through car shortage have been reported. Deliveries of materials have been handicapped at various periods throughout the year, metals from Chicago and Pittsburgh having been subjected to from one to two weeks' delay most of the year. The freight embargo at various points has had its effect at times.

Many Rochester industries are large users of aluminum. A large volume of the metal was in stock here during 1916 and 1917, warehouses having been filled long before the United States entered the war. Of late, however, much difficulty has been experienced in obtaining supplies from the Pittsburgh district, owing to the fact that the entire output of the mills has been subject to Government pressure. The Government is using so much aluminum in naval and aeroplane construction that but little has been obtained here of late. Spot aluminum is quoted here at 38c. virgin weight.

The market for copper in Rochester is easy. There are two mills near this city and deliveries are good. Plenty of soft copper is available and can be obtained in a reasonable time. The metal is quotable here at 35c.

Spelter is also easy, and is being obtained in fairly large quantities. Rochester industries require a tremendous amount of spelter. The spot market is quoted at 7.75c. delivered East St. Louis.

Tin sheets in 100-pound boxes are quoted all the way from $9.35 to $12 at this writing. The market is very firm for all grades of tin.

The market for most kinds of brass in this city is easier than

it has been in many months. Deliveries are good. The narrow sizes of common yellow brass sheets are quoted at 27c., according to size, and brass rods at 24½c. The wide sizes are difficult to obtain, owing to the fact that the demand for government purposes has almost reached capacity limit. The great bulk of the wide brass output is being absorbed by the federal shipyards.

Rochester is a big scrap metal producer, several large plants being in active operation here. All of the industries have prospered during the past year, and anticipate continuance of present conditions. Scrap yellow brass is quoted at 15c., red brass at 23½c., copper at 24½c., zinc, 6½c., and tin 80c. Aluminum is offered in small quantities and is quoted at 25c.

The business outlook in Rochester for the coming year is optimistic. The railroad situation is the only real fleck upon a fairly clear sky. Many of the larger industries are expanding, owing to war demands, and the establishment of war-material plants in this city. There is no capital available at this particular time for the backing of new industries—not from a lack of money, but from a natural reluctance to engage in new enterprises under present business conditions.—G. B. E.

CINCINNATI, OHIO

JANUARY 7, 1918.

The year closed for members of the metal trades in this section with the same high degree of activity which has been in evidence not only all during 1917, but practically ever since the war started. The almost incredible demand for the products of the big machine-tool shops which make up the greatest and best-known of Cincinnati's industries continues unabated, accentuated by the fact that Uncle Sam himself is now asking the makers of tools to speed things up in order to help out the making of munitions for the army. This means that instead of any let-up in operations during this year, there will rather be a still further crowding of every possible facility in order to make production reach new marks. In brief, the trade realizes that it is one of the most essential in the conduct of the war, and leaders and men alike are doing all that they can to keep things going at top speed. The car situation and the fuel shortage growing out of traffic difficulties constitute the most serious obstacle to maximum production, inasmuch as it is impossible to operate without plentiful and regular supplies of coal, and it is likewise impossible to do business satisfactorily without a free movement of cars with metals and materials coming, and of loaded cars going out. It goes without saying that the new traffic administration will do all in its power to help out this condition, and it is hoped that before long some order will be wrought out of the chaos which at present exists in traffic conditions; but at present the transportation problem is the most serious which the trade has had to face. Coupled with this, however, is the labor problem, which arises not only out of the loss of thousands of skilled workers to the various branches of the Government service, but out of the enormously increased output which is now necessary, for the reasons indicated. Means of meeting this shortage of labor are not now clear, although it is certain that before long, if the war continues, the employment of women in many of the operations now handled by men or boys will be necessary, as it has been in England and other countries at war. A step to fill the vacancies in the ranks of the workers has been taken by a proposal to use school shops in Cincinnati for training new workers, thus releasing machines in the plants now used for training new men, and at the same time providing a constant supply of partly-trained mechanics. The proposal was made by Superintendent of Schools Condon to the Metal Trades Association of Cincinnati, and will probably be accepted and acted upon. In any event, 1918 bids fair to eclipse even the past three years in point of activity in the tool industry and the various accessory branches of the metal trades involved.

One of the largest industrial transactions handled in Cincinnati in several years was consummated a short time ago by the D. T. Williams Valve Company, when that company purchased outright the plant of the Queen City Brass & Iron Company on Spring Grove avenue, paying about $300,000 for it. The Williams company will be enabled by the acquisition of this plant virtually to double its capacity, taking over a fully-equipped factory and 100 employees. The two companies are working on similar orders, and the transaction solved the problem of the Williams company in taking care of its business. The deal was handled by Robert E. Mullane. The company will increase its capitalization to take care of the expansion, from $250,000 to $700,000, it is understood. The property taken over is near the plant of the Williams company, and comprises 100 by 240 feet, with a two-story building.

The Liberty Machine Tool Company, of Hamilton, Ohio, is a new concern in the tool trade there, recently being organized with a capital stock of $100,000. Peter Benninghofen is president, Abe Ballinger is vice-president, Charles E. Heiser, treasurer; Brandon R. Millikin, secretary, and A. R. McCann, general manager. The Richter Brass Company has been incorporated in Cincinnati with a capital stock of $35,000 by John H., Joseph A. and Charles H. Richter, Adolph D. Fennel and others.—K. C. C.

COLUMBUS, OHIO

JANUARY 7, 1918.

The metal market in Columbus and central Ohio territory ruled fairly quiet during the past month. Buying on the part of users was only for immediate needs and there is no disposition to accumulate stocks for the future. The supply of most metals is apparently adequate for all needs and the demand is steady but not active. On the whole the market is in a rather unsettled condition, due to governmental regulation and uncertainty as to the future.

Prospects for 1918 are not well defined, according to metal experts. With governmental regulation stepping in to take the place of supply and demand prices are not a thing to be changed to any great extent. Governmental distribution of certain metals is expected to be more rigid than in the past. But undoubtedly there will be a good demand for certain metals, such as copper, brass, aluminum, tin, zinc and spelter in this territory. On the whole it is believed that it will be a fairly good year for metal houses.

Copper is moving fairly well and prices are unchanged at government figures. Brass is selling fairly well at unchanged quotations. Aluminum is quiet and prices show a rather wide range. Zinc is selling in the neighborhood of 8½ cents per pound. Type metals are in good demand and probably the best feature of the market at this time. Other metals are unchanged and quiet.

The Bowen-Beardsley Company, of Columbus, has been incorporated with a capital of $10,000 to manufacture valve lifters and many other kinds of metal articles. The incorporators are: C. N. Bowen, J. G. Bowen, E. L. Beardsley, Samuel Fippin and Alva L. Beardsley. One of the things to be developed by the company is a metal stamping business.

The Ashland Brass Foundry Company, of Ashland, Ohio, recently organized by James Kauffman and Waldo Kauffman, has established a plant at that place for the manufacture of aluminum castings.—J. W. L.

CLEVELAND, OHIO

JANUARY 7, 1918.

The close of the year finds the metal industry of Cleveland in a most prosperous condition, but closing one of the most eventful periods in the history of the trade. Several factors have entered into this, notably the shortage of raw materials and the shortage of railroad cars to haul the finished product. During the last few weeks of the year a severe cold spell, paralyzing traffic and practically putting a stop to production in many lines, also affected the industry. This last was due to the almost total depletion of supplies of coal in and about Cleveland, with the result that the Illuminating Company, which supplies 3,000 industrial plants, was forced to cut off its electrical supply from more than half of these. Among the plants affected were several in this industry. The stoppage of work threw close to a quarter of a million men and women out of employment. The suspension lasted two days, until the priority order issued at Washington at the request of Governor Cox, brought coal to Cleveland and other northern Ohio cities directly from the mines, taking precedence over all other shipments, even food.

Plans for the new year not only include the establishment of several new firms in the Cleveland district, or at least new plants for present ones, but also include the expansion of all establishments engaged in war orders. Not a little influence will be felt in the manufacture here of the Liberty motor for aeroplanes and

motor trucks, contracts for which soon will be placed by the government. Large quantities of aluminum will be required for this work alone.

Plans for the new factory of the Monarch Brass Company are nearing completion, and will be announced this month. The plant will rise on a plot of ground purchased several months ago at Payne avenue and East 45th street.

Plants of the Briggs Manufacturing Company and the Enamel Products Company, in the East End, have been completed during the period, and orders on government and regulation work are being rushed.

A brass foundry, backed by M. A. Garvey and L. J. Garvey, of Sharon, Pa., is planned for Warren. A large factory building in the district has been leased, and machinery soon will be installed. Later it is the intention of those back of the project to erect a foundry. Brass castings will be the product, as there is a big outlet to factories in this district. M. A. Garvey will be manager of the plant, which will employ perhaps forty men at the start.

Plans for increasing the production of aeroplane parts and tools have been completed by the Vichek Tool Company, recently incorporated by F. J. Vichek, A. M. Meckes and a group of Cleveland business men for $900,000. This firm is the outgrowth of the old Vichek Tool Company of this city. With the new blood comes plans for expansion, which include the erection of an extensive addition to the present plant in Quincy avenue.

More than three tons of aluminum, in 30-pound ingots, and believed to be consigned to a Cleveland war order plant, were stolen from the Nickel Plate East 79th street station this week, being hauled away in an auto truck. The material is believed to be worth $2,000. Another robbery, in which the Walwroth Run Foundry Company was victimized, was that of brass and aluminum patterns worth $1,000. Here also a truck was used. The goods weighed 200 pounds. Neither material nor thieves have been found.

Annual meeting of the Sheet Metal Contractors' Association was held December 18 at Hof Brau Haus. Little business was attended to, the event being primarily an entertainment, which war arranged under the direction of George Stran, W. E. Feiten and John M. Pfander. The guests were representatives of jobbers and manufacturers in the sheet metal trades.

Sheet metal work at Fairmount High School is now one of the leading studies in the manual training course. The work is under the direction of J. A. Crowell, who will not permit any novelties to be produced this year. Pupils must produce practical articles. Among those produced this month, and which indicate the trend of the youthful mind toward this industry, were a chicken brooder, a 36 section mail box, bread tins and the like. The shop is one of the most complete in the city.—C. C. C.

DETROIT, MICH.

JANUARY 7, 1918.

The brass copper aluminum and grey iron industries here are closing one of the most prosperous years in their history. At the same time they are entering one of the best futures ever predicted.

Detroit is the center of trade in these lines. Within the last four or five months it has vastly increased its facilities in all these individual lines. The automobile business and the munition business has been greatly prosperous. The government is placing millions of dollars in contracts for motor trucks, and aeroplane engines and parts. The automobile body companies, who use large quantities of aluminum in their work, have large contracts for aeroplane parts. The Detroit Shell Company is a new $1,500,000 corporation that has a $35,000,000 contract and is reported negotiating for a plant of an automobile company that has not been very successful. It will employ thousands of women and men, both skilled and unskilled, in this line. It is said large numbers will come to Detroit from Canada where they previously have been employed.

The Dodge Brothers, manufacturers of automobiles here are completing a new million dollar plant on the eastern side of the city where they will manufacture gun recoils. This concern also will use brass, copper and aluminum, it is understood. The Packard Motor Car is another concern which has contracts, it is reported, of many million dollars and is working to capacity. The Ford and Cadillac Companies also are found to have contracts for millions of dollars.

It is reported great activities will commence here among the manufacturing concerns within 90 days, and Chester M. Culver, general manager of the Employers' Association, says manufacturers are now scouring the country for skilled mechanics. The highest wage is being paid as an inducement. He stated that Detroit's future never was so bright and that the greatest boom the city has ever known will be on before spring. F. J. H.

CHICAGO, ILL.

JANUARY 7, 1918.

Conditions in the metal trade in Chicago during the past year have been exceedingly prosperous. Business has been good, and in fact rushing, for the most part, and the chief trouble has come in connection with getting labor sufficient to take care of the needs of the plants. During the past few months automobile business, which is a mainstay of many of the smaller plants, as well as larger ones manufacturing specialties for this trade, has shown a tendency to slow up, especially as manufacturers of motor cars, in line with Government restrictions placed on the production of their product, have been cutting down their orders for 1918 delivery.

However, it is believed that this slowing up of business in that direction will prove to be only temporary. As soon as the motor car industry is able to divert part of its resources to war lines, such as trucks, aeroplane engines and parts and other products which are needed for war work, the metal trades which have been supplying it will experience a resumption of the heavy trade which they have been accustomed to handle from that direction.

The war, of course, is the big factor in the situation at present, affecting not only demand but operating conditions. Labor is at present in fairly good supply, but manufacturers are not at all optimistic over the outlook in this respect. Some of those who have been considering the future are talking about the employment of girls, but in most instances little has been done along this line. The larger manufacturers of electrical supplies in Chicago are using a much greater number of girls than heretofore, but it is a question whether the aluminum and brass manufacturers will add many of them to their payrolls, unless the labor situation becomes much more serious than it is at present.

Labor troubles have kept some of the plants from turning out their maximum production during the past few months. One large factory on the West Side was tied up for several weeks owing to a strike in its brass foundry. The claims of the men for higher wages were finally disposed of by means of a compromise, and the plant is now operating in all departments. The higher cost of living and the prospect that living costs will remain high for some time to come is blamed by manufacturers for the unrest which seems to mark the labor situation.

The old metals situation has been an interesting factor during the past year. Some big business is being done along this line, and certain concerns on the South Side are turning over a large number of junk automobiles as a means of recovering the metal. However, this idea is not as effective as it once was, as the public has become familiar with the possibilities of such exploitation, and closer bidding is now the rule. The concerns which are specializing in the dismantling of old automobiles are using considerable space in the classified columns of the daily newspapers, however, and promise to pay cash for all of the cars which they accept.

Another source of metal, which is being developed to a larger degree than ever before, consists of used engravings. One of the concerns which has been most aggressive in getting in touch with those having material of this kind to offer is the Woodlawn Metal Company, which operates on the West Side. H. S. Dreyer, of this concern, stated that it is always in the market for electrotypes, stereotypes, copper half-tones, zincs and foundry type. He has been getting in touch with publishers, large advertisers and others who handle a considerable quantity of engravings, and has found this a prolific source of metals. Owing to the fact that many advertisers have had no outlet for this material heretofore, little attention has been paid to its disposition, and the cuts have been carried indefinitely, even when they have become obsolete.

The Imperial Brass Manufacturing Company, of Chicago, which

is now manufacturing the Watrous line of plumbing fixtures, has increased its plant at Harrison and Racine, doubling its capacity. It now has 160,000 square feet of floor space. The Watrous line includes a number of popular specialties, such as liquid soap dispensers, and is to be featured in the sales promotion work of the company. It has also been busy of late with its Imperial primer, a device enabling automobiles to start readily in cold weather.

M. J. Carboy, a well-known contracting plumber and steam fitter, has been specializing of late in the installation of sterilizer outfits for water systems of hospitals. A feature of this is a Powers regulator, controlling the temperature, and a series of four 100-gallon galvanized tanks with brass coils for heating the water and then reducing it to the desired temperatures. Mr. Carboy reports that he has equipped a large number of hospitals in Chicago with this outfit, as the absolute sterilization of water used in operating rooms, etc., is necessary.—G. D. C.

LOUISVILLE, KY.

JANUARY 7, 1918.

A resumé of conditions in the Louisville metal working trades during the past year developes the fact that the majority of concerns lost much of the distillery work, which for many years has been the big factor in the copper trade of this section. However, the loss of this highly profitable business is resulting in the various members of the local trade getting out and developing new lines. Such development can only be made through long and deliberate study of the lines undertaken and readjustment of the business, new shop equipment, tools, etc., in order that new lines can be handled scientifically. Getting new business of any kind costs a great deal and in the case of the Louisville houses it has meant extending into new territory, and going a considerable distance from home for work, this resulting in higher expenses and a corresponding decrease in profits, as there is competition for all work.

A few concerns managed to keep on full forces of the same average size that have been employed during the past three or four years, but labor has been scarce and high, and the increased cost of operation generally has made it necessary for everyone to hustle to keep things going. However, the majority of the houses have managed to obtain enough work of some sort to keep them going fairly steady, and while profits are not to be compared with those of former years, the general consensus of opinion is that the trade did much better than had been expected. The outlook for 1918 is a bit hazy just now, but direct and indirect government orders are increasing, and several concerns are making efforts to land some of this work. A few concerns have managed to obtain such business during the past year, and have found it profitable to handle.

Matt Corcoran, Jr., of Matt Corcoran & Company, in discussing the situation, said: "We have been reasonably busy throughout the year, but have been forced to undertake much new work of a kind that has never before been handled in our shop, and to go a much greater distance in order to obtain work. Much of this work has not been very profitable to us, but we have laid a good foundation and believe that as we grow familiar with the new lines we will be in position to handle them much more cheaply. I believe that the new year will be fairly active, and that direct or indirect government orders will help considerably."

Although the copper trade has not been extremely busy during the year Louisville as a whole has been a very prosperous center, this being shown by the report of the clearing house, which shortly after the middle of December reported that bank clearings had exceeded a billion dollars for the first time in the history of the city. Bank clearings of such an amount would go to prove that business has been brisk, and that things are fairly brisk.

Several Louisville concerns are watching with much interest the activity shown in shipbuilding, and are planning to get a piece of the business. As most of the pipe lines and other metals used in ship construction are of copper, and the work will be placed on bids, the distance from Louisville to shipbuilding district will be about the only drawback in getting the business. Plans have been received by some of the companies, the bids calling for the copper pipe and other work on from one to three hundred ships. As the building will naturally be rather slow it is believed that some of the big copper working shops could keep up with the demand without any great trouble.

Material prices have shown very little change during the past month. Ingot copper though supposed to be a staple at 23½ cents a pound is commanding a price of 24 to 25 cents a pound where purchased by the average consumer. Scrap copper is quoted at 22 cents, but during the past month it has changed hands at twenty-five cents per pound. Base price tubes are worth forty cents, and sheet copper, base, 31½c. Light scrap brass is worth 12 a 14 cents and heavy is quoted at 18c. Scrap is well cleaned up, and dealers in scrap metals have been combing the district for supplies.

"The past year has not been a very big one for us, but we have managed to keep fairly busy even with the loss of our customary fall work on beverage distilleries," remarked Tom Hines, of Hines & Ricthey, who continued: "However, milk machinery has been in big demand, and we have orders on hand that will run us past the first of April. I can't see any big volume of work in sight for the new year, but with quantities of new government work coming out I believe that the trade will be kept fairly busy."

The Vendome Copper & Brass Works reported that 1917 closed considerably behind 1916, but that indications were for fairly active business for the life of the war at least, although the ending of the war might leave the Kentucky coppersmiths with very little in sight. Very little new work is being carried over into the new year, but conditions are generally good, big business active, and the outlook is good.

The C. Lee Cook Manufacturing Company, of Louisville, has been busy throughout the entire year on some big government contracts for special equipment for naval requirements. This concern has been operating its shops to capacity, and has sublet much casting work to other concerns. The Independent Brass Foundry has done a lot of casting for the Cook concern, and also on direct government orders, and these two concerns report that they are far ahead of previous years. John Rademaker of the Independents works reported that the concern doubled its business as compared with 1916.

The demand for brass and copper plumbing goods fell off considerably in the Louisville district during the last few months of the year, carload shipments having fallen down badly. However, business for the year was fairly active considering the fact that building operations were very light, and in fact between three and four million dollars under the best years. The Standard Sanitary Manufacturing Company, Ahrens & Ott plant at Louisville, furnished many cars of material for use in the Army cantonments, including brass and enameled goods, and up to the present time has been very busy. The company has distributed Christmas checks to all of its employees in Louisville, these checks amounting to one-half of a month's salary, and resulting in a total outlay of $30,000. O. V. N. S.

TRENTON, N. J.

JANUARY 7, 1918.

Business was very good during the past year in the metal manufacturing plants of Trenton and vicinity and it is believed that prosperity will prevail during the coming year. The manufacturers have had more to contend with during the past year than in former years. Some of the plants were affected by strikes when employes demanded more wages and then came the big increase in prices of raw material. This was followed by a great shortage in coal and a scarcity of cars in handling products ready for shipment. Then later came an order from the government announcing that certain products might be commandeered and this frightened many purchasers. After figures had been given on old contracts a readjustment had to be made to suit the new figures on products. Wages were gradually increased in all the plants and even laborers are now receiving the same formerly paid to some mechanics before the world war began. The uncertainty of securing skilled help also greatly affects the manufacturers at the present time and orders are delayed as a result.

Trenton manufacturers are optimistic over the future and

believe that business will continue good in view of the fact that there is no likelihood of the war coming to an end soon.

The Ingersoll-Trenton Watch Company is experiencing a very busy season at this time and has plenty of orders on hand for a busy winter and spring. The plant is now rushed to such an extent that the employes are not only working full time, but also overtime. The company had big orders for the holiday trade and was compelled to exert every energy to turn them out. Fortunately, the Ingersoll company has a good supply of coal on hand and will not be compelled to shut down temporarily as several other Trenton manufacturers had to do lately because of the lack of fuel.

The Skillman Hardware Manufacturing Company is running full handed and is working on government orders at the present time. While the company found a shortage of coal at different times it always managed to secure enough fuel to keep the plant running. The conditions for coal are now brighter and the concern expects no further trouble. Several employes of the Skillman company have been drafted, but their places have been filled. The company uses steam power and is not compelled to shut down when the Public Service Corporation turns off electric current temporarily each afternoon.

Several of the Trenton metal plants are working on government orders and brass workers find plenty of work. Exclusive of war contracts the markets throughout the country are demanding an unusual supply of metal goods. The McFarland Foundry & Machine Company reports business good. The Clifford Novelty Works had a busy holiday season and has enough orders on hand for a good winter and spring trade.

The Skillman Hardware Manufacturing Company has been reorganized to take over the plant of the old company, which was organized many years ago. The new company was incorporated with the Secretary of State with a capital stock of $125,000. The incorporators are William G. Wherry, who became president and treasurer of the company following the death of E. V. D. Skillman, the founder of the concern; John W. Shuster, the assistant general manager, and Jacob Bohnenberger.

The United States Metal Refining Company has purchased a 120-acre tract at Chrome, N. J., and will build a large plant on the site. The Columbia Bronze Foundry Company has increased its capital stock from $10,000 to $200,000 and will build an addition to the plant at 529 Columbia avenue, Camden, N. J. The Wright-Martin Aircraft Corporation, Stelton street, New Brunswick, has awarded a contract for a big addition to its aluminum foundry. The plant is very busy at the present time and needs more manufacturing space. The Art Metal Works, 7-15 Mulberry street, Newark, N. J., has purchased a site adjoining its plant and will erect several additions for the manufacture of metal specialties. President L. V. Aronson will let the contracts soon for the new structures.

L. Adler & Company, New Brunswick, has been incorporated with $25,000 capital stock to manufacture metal electrical fixtures. The incorporators are Louis P. Ruck, Robert Rosen, Louis Adler, all of Bound Brook, N. J. The G. W. Bradley Axe and Tool Manufacturing Company, Inc., of Jersey City, has been incorporated with $10,000 capital and will engage in the manufacture of hardware, etc. The incorporators are G. W. Bradley, of Westport, Conn.; H. A. Daniel, of Newburgh, New York; and Charles Hogue, of New Rochelle, New York. The La Brecque Company, of New York, has purchased the plant of Carr & Ball, 118-132 Passaic avenue, and will use the buildings for the storage of metals and wire merchandise.

The American Standard Metal Products Company, of Jersey City, N. J., has been chartered with $1,000,000 capital stock to engage in the manufacture of metal goods of various kinds. The incorporators are E. B. Cadwell, Howard Brooks and John W. Wynne, all of Jersey City. The Simmons Hardware Company, of Bloomfield, N. J., will build an addition to the plant on Valley road. C. A. L.

NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The one-story, 145 x 240 feet, addition to the plant of Kahn Brothers, manufacturer of metal, 795 Humboldt street, Brooklyn, N. Y., has been completed.

The Mattatuck Manufacturing Company, Waterbury, Conn., manufacturer of Brass goods, is building a four-story reinforced concrete factory.

The New Jersey Zinc Company, New York, N. Y., is building a three-story, 60 x 100 feet laboratory at its plant at Palmerton, Pa. The estimated cost of the building is $200,000.

The Bureau of Yards and Docks, Navy Department, Washington, D. C., has awarded the contract for a one-story brass foundry, 144 x 300 feet, at the Washington Navy Yard to cost $281,506.

Richard Lau, manufacturer of Buffalo, N. Y., has closed a deal with the Chamber of Commerce of Marion, Ohio, for a brass and bronze foundry for the manufacture of castings which are needed by industries in and around Marion.

The Galvanizing Corporation of America, Inc., 244 Eagle street, Brooklyn, N. Y., has taken over the business of the Metal Treating & Equipment Company and will carry on the business of job galvanizing and the installation of electro-galvanizing plants.

The Powhattan Brass & Iron Works, Charleston, W. Va., has awarded the contract for a one-story addition to its foundry. The company operates a brass and bronze foundry, brass machine shop, grinding room, tool room, casting shop and plating and polishing department.

The Brassart Fixture Company, formerly located at 13-15 Laight street, New York, has become consolidated with the old established firm of Shapiro and Aronson under the name of Shapiro & Aronson, Inc., Brooklyn, N. Y., with show rooms at 20 Warren street, New York.

James L. Sparks, brass founder, 320 West Grand avenue, Chicago, Ill., is building a one-story brick foundry, 48 x 125 feet, at 1723 Carroll avenue at a cost of $12,000 and which he expects will be completed about the first of April. Mr. Sparks states that he is in the market for brass foundry equipment.

The National Galvanizing Company, Philadelphia, Pa., which recently acquired the property at 1609-13 North Front street, is now equipping its plant and expects to have the most modern galvanizing plant in the world. The company operates stamping, galvanizing, japanning and lacquering departments.

The Bridgeport Brass Company, Bridgeport, Conn., has inaugurated a system of group life insurance which includes benefits for accidents and sickness. Under the Bridgeport Company's plan, any employee may receive half of his wages up to a certain maximum for a period not to exceed 26 weeks for disability or sickness and a maximum life insurance policy of $1,000.

The Sandusky Foundry & Machine Company, Sandusky, Ohio, has acquired a site for a foundry addition adjoining its plant. When completed the new building will be used largely to make operations more convenient for handling increasing business. The company states that they are not in the market for equipment except for a large second-hand furnace of the Hawley type to be used as a spare furnace.

The Fifth National Foreign Trade Convention will be held at the Gibson Hotel, Cincinnati, Ohio, February 7 to 9, 1918. The principal theme which will occupy the attention of the convention is "The Part of Foreign Trade in Winning the War." The work of organizing the convention is being conducted by O. K. Davis, secretary, National Foreign Trade Council, 1 Hanover Square, New York, to whom any inquiries concerning the occasion should be addressed.

The following officers were elected at the January 8, 1918, meeting of the Editorial Conference of the New York Busi-

ness Publishers Association, Inc.,—Chairman, R. V. Wright of the Railway Age Gazette; secretary-treasurer, F. M. Feiker, Electrical World, and executive committee, F. W. Parsons, Coal Age; S. H. Ditchett, Dry Goods Economist; David Beecroft, Automobile; F. E. Rogers, Machinery and C. B. Thompson, Bakers Review.

The York Hardware & Brass Works, Wheatfield and Commerce streets, York, Pa., has acquired the former car shops of Billmeyer & Small, to be used for extending its operations, adding about 25,000 square feet of floor space. It will be equipped as a foundry and bronze and aluminum castings will be made; the company having large contracts with the Emergency Fleet Corporation, United States Ordnance Department and the United States Navy. The new plant will give employment to between fifty and sixty molders.

David Levine, who for the past four years has been instrumental in building up to its present proportions the business of the Terrace Electro Plating Company, 241 Center street, New York, has severed his connection with that company, and on January 1 assumed the management of the Arizona Lacquer Manufacturing Company, Inc., Smith and 9th streets, Brooklyn, N. Y. This company manufactures lacquers, enamels and colors for all uses connected with metals, and Mr. Levine states that they are in a position to supply satisfactory materials for any requirements in this line.

The Matchless Metal Polish Company, manufacturers of polishing and buffing compositions, report that a change was made recently in their New York office, which is now under the management of P. W. Ellwanger, general manager of the company, who states that with increased experimental and manufacturing facilities they are in a better position than ever to take care of the polishing, buffing and finishing compositions trade in the Eastern markets.

The company's Chicago office is at 840-842 West 49th place, and the New York office at 149-151 Varick street.

The United States Gearshift Company, Eau Claire, Wis., has awarded the contract for the construction of the first unit of its new four-story plant, 65 x 80 feet, with a separate office building, 20 x 65 feet. The brass and aluminum foundry will be located on the fourth floor and will be equipped with gas furnaces. The machine shop will occupy the third floor and the assembling and finishing departments the second floor. When the new plant is completed, manufacturing operations will be conducted under contract with the Eau Claire Manufacturing Company, which has started its new foundry and machine shop.

United Smelting & Aluminum Company, Inc., New Haven, Conn., announces that it has a patented process for electro-plating aluminum, which process follows closely the standard process of electro-plating other metals, and from which the same uniform results are obtainable as with other metals.

As far as is known to the company, this is the only successful process in existence whereby aluminum may be plated with nickel, silver, copper, etc. The process is equally applicable to pure aluminum in sheets, rods, wire, tubing, etc., and to aluminum alloyed with other metals, as in moulded or die castings.

Backed by an experience of fourteen years in the handling of sheepskins, the Yorkville Manufacturing Company, Brooklyn, N. Y., state that they are in a better position than ever to furnish sheepskin polishing wheels. These wheels are made from the best tanned skins and none but those of uniform grade are used. Any diameter or face wheel can be furnished on short notice. The best of workmanship is evident on this company's wheels, whether they be loose, sewed or cemented.

The Yorkville Manufacturing Company claim to be the largest producer of these polishing wheels, and they guarantee prompt delivery and at most reasonable prices.

The Webster & Perks Tool Company, Springfield, Ohio, announce that they have extended their line of polishing and buffing machines and are now building some 18 different sizes, as well as 25 sizes and styles of grinding machinery, to say nothing of accessories. In these lines they feel that they are not very far behind "Mr. Heinz" 57 varieties, and that they can satisfy every need and appetite along this line. The company also manufactures bolt pointing, threading and special tapping machinery. They have issued a convenient Vest Pocket Speed Table which will be mailed along with their Bulletin No. 22 to interested persons who write to the company in care of Post Office, Box 1500, Springfield, Ohio.

INCREASE IN CAPITAL STOCK

The Fidelty Metal Company, Brooklyn, N. Y., has increased its capital stock from $50,000 to $250,000.

Thomas Paulson & Son, Inc., Brooklyn, N. Y., operating a brass foundry at 97 Second avenue has increased their capital stock from $30,000 to $100,000, the proceeds to be used for extensions and improvements.

The Dayton Bronze Bearing Company, Dayton, Ohio, has increased its capital stock from $10,000 to $50,000. The company operates a brass, bronze and aluminum foundry and brass machine shop, and will erect an addition to its plant at 918 East Third street.

REMOVALS

A. H. Wolf, dealer in metals, New York, N. Y., has moved from 30 Church street to their new office and warehouse at 120 East 32nd street.

The Great Western Smelting & Refining Company, Detroit, Mich., has moved from 714 David Whitney Block to its new offices and warehouses at 709-717 Loraine avenue. J. B. Neiman is manager of the Detroit branch of this company.

Gannestad and Jacobsen, engineers, Benedum Trees Building, Pittsburgh, Pa., has moved to larger quarters in the B. F. Jones building in order to be able to take care of increasing business. The company states that they are prepared to act as consulting engineers and also to equip plants for electric galvanizing. They also control the Jacobsen system of electric galvanized pipes and rods, etc., and they handle a brass melting furnace.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

To manufacture metals and alloys.—I. Shonberg, Inc., Brooklyn, N. Y. Capital $10,000. Incorporators: I. Shonberg, B. Shonberg and T. Mayer.

To operate a foundry and machine shop.—Alloy Foundry & Machine Company, New Rochelle, N. Y. Capital $10,000. Incorporators: A. C. Wakeling, G. C. Pansegrau and W. E. Wollheim. The company expects to have its plant in operation by the middle of this month.

To manufacture metal caps, etc.—The Imperial Metal Manufacturing Corporation, Brooklyn, N. Y., has been incorporated to take over the Imperial Metal Manufacturing Company. The capital stock is $75,000 and the directors are Carl Bomeister, Sigmund Messner and Oscar Soudheim.

To manufacture plumbing specialties.—The Richter Brass Company, Cincinnati, Ohio. Capital $35,000. Incorporators: John H. Richter and others. The company will operate a bronze foundry, brass machine shop, tool and grinding room, casting shop and plating and polishing departments.

To manufacture aluminum castings.—The Dayton Aluminum Company, Dayton, Ohio. Capital $10,000. Incorporators: Leo Stotter and Fred Eldridge. The company operates tool room, spinning, stamping, galvanizing, tinning, soldering and polishing departments. The company states that they are in the market for polishing and buffing supplies and tinning tools.

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

PRINTED MATTER

Metals, etc.—C. W. Leavett & Co., New York importers and exporters of ores, metals and alloys have issued a vest pocket diary and calendar for 1918 which contains a lot of information valuable in every day business.

Metal Calendars.—Calendars have been sent out by the following metal manufacturing concerns: The Standard Rolling Mills, Inc., Brooklyn, N. Y., manufacturers of sheet britannia metal, casting metals and special compounds, and the Atkinson Company, Rochester, N. Y., manufacturers of brass, bronze, and aluminum castings and plumbers' brass goods.

War Revenue Law of 1917—The Federal Trade Information Service, Washington, D. C., has issued a most convenient sized pamphlet containing the full text of the War Revenue Law of 1917, approved October 3, 1917. This booklet, which is 4 x 9 inches in size, containing 90 pages, includes the full text of the law with an authoritative analysis and exposition of its provisions. The law is indexed by titles.

Mineral Notes.—The Foote Mineral Company, Philadelphia, Pa., has issued catalog No. 12, December, 1917, of Mineral Foote-Notes. This issue of this interesting little brochure is devoted to a description of "Titanium—Its Occurrence and Commercial Uses" and a list of the various rare metal alloys, ores and compounds that this company handles under the name of Fominco specialties. Copies of the booklet may be had upon request.

Chemical Action on Metals.—The Munning-Loeb Company, Matawan, N. J., has issued a very convenient hanger chart 8 by 11 inches in size, which contains a table of acid and alkali actions on metals arranged by G. S. Robins. This table shows how certain acids and alkalis react upon a number of metals and will give the electro-plater ready information as to the kind of acid dips to use for stripping the plate from the base metals. Copies of this very valuable table may be obtained from the above company.

American Institute of Metals.—The Journal of the Institute for December, 1917, has just made its appearance. This pamphlet, which is No. 3 of the series of Volume 11, contains 155 pages and is well up to the standard of the two numbers preceding the issues of June and September. The subject matter of the journal is made up of the papers and discussions which occupied the attention of the members at the last convention held in Boston, Mass., September 24th to 28th, 1917. This journal is now published quarterly by the Institute.

Employees' Benefits.—The Bridgeport Brass Company and the American Tube and Stamping Company, Bridgeport, Conn., have issued small pamphlets giving information relating to co-operative plan of benefits covering accidents, sickness and death for employees which these companies have lately put into force in their plants. The plants, as outlined in the pamphlet, are very liberal and certainly are designed to insure the best interests of the metal worker. The above companies would be pleased to send copies of these pamphlets to any concern who might be contemplating the installation of such a co-operative system.

Metal Working Machinery.—The P. Pryibil Machine Company, Inc., New York, has issued catalog No. 13, which is devoted to their complete line of ball bearing metal spinning lathes and accessories for round and oval work and ball bearing polishing and buffing lathes. In addition to descriptions and illustrations of metal working machinery the catalog, which contains seventy pages with an index, also has a number of plates colored in silver, bronze and brass of the great variety of stamped and spun metal goods that can be made by the use of the Pryibil machinery. The catalog is 5 by 7½ inches in size and is bound in green Fabrikoid with stiff covers.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL MARKET REVIEW OF 1917—OUTLOOK FOR 1918

WRITTEN FOR THE METAL INDUSTRY BY W. T. PARTRIDGE.

The unprecedented volume of business transacted in 1917 by the United States in its world-wide trade eclipsed all previous record-breaking years and surpassed by more than $1,000,000,000 the values of 1916 which were heralded as most extraordinary. Department of Commerce statistics for the first eleven months of the year, just issued, value total exports of all merchandise, to November 30, inclusive, at $5,639,000,000 against $4,959,000,000 for the entire period of 1916 and $3,195,364,485 in 1915. Including reliable estimates for December—official figures being not yet available—the excess in value of exports over imports for the year amounts to $3,600,000,000. Total imports for the year are estimated between 50 and 60 per cent. greater in value than in 1913, while the trade balance in favor of this country accumulated since the war began to December 1, 1917, is $8,040,004,699, or approximately $9,000,000,000, by the close of the year. An important point to be noted in this favorable comparison for 1917, in its bearing upon the future outlook, however, is that whereas in each of the two preceding record-breaking years, the valuations of exports increased generally from month to month as those years progressed, in 1917 the highest valuations were in January—$613,555,693—with gradually decreasing figures to the lowest point in July, $374,000,000; after which there was a moderate increase each month, with November values placed at $488,000,000. Another point that should not be overlooked is, that much of the increased valuations must be attributed to the higher prices of all commodities.

Stupendous difficulties, including the constant danger to shipping from the German U-boat warfare, were encountered and mastered in the accomplishment of the 1917 maximum business record. Adverse influences affecting metal industries particularly were first the uncertainty generated in trade as soon as it was rumored that Government regulation of prices and the distribution of metals were contemplated as being necessary in order to obtain promptly, sufficient quantities of war materials, not only for the United States but for our Allies as well. The one price for all idea was strongly objected to in some quarters as tending toward unfairness to American interests. Unsettlement of business followed and transactions other than those with the Government were completely suspended temporarily, in the case of each metal as it was taken up for regulation of distribution and price fixing, until adjustment could be made to the new conditions—iron, steel and copper prices being the only ones established at this writing while a decision in regard to the price of silver was momentarily expected. The regulation of tin was well under way and definite action had been taken in placing all importations under control of the Iron and Steel Institute. In the case of spelter and lead it was believed that only maximum prices would be established. Aluminum and antimony were taken up for con-

sideration late in the year and prices of old metals, it was believed, would continue to be based upon prices fixed in the major metals market.

Inadequate transportation service throughout 1917, due to inefficient management and a lack of foresight in providing a sufficient number of cars and locomotives for handling the enormously increased business of the war seriously interfered with and retarded not only deliveries of ore to smelters and shipments from refineries, making it necessary in some instances to cease operations, but affected business adversely all over the country. Congestion at terminals resulted in embargoes that temporarily impeded traffic at some points while benefitting others and these conditions continued to harass all industry at the close of the year after having been somewhat improved during summer months. In the last week the Government has taken over the railroads and greatly improved service is expected as soon as its regulations are in full force.

Prolonged and serious labor difficulties—strikes that required Government interference and control before being finally settled late in the year—as well as numerous fires incendiary and accidental, at different points over the entire country, affecting production at mines, smelters and refineries and which were generally believed to have been instigated by pro-Germanism, added another huge problem to those that must be solved, if business and war are to be successfully carried on.

At the close of the year, transportation problems loom larger as a menace to the future than Government price fixing which is proceeding slowly but satisfactorily on the whole. Labor difficulties are believed to be under control temporarily, at any rate, if not for the whole period of the war's duration.

COPPER.

The year just closed in the copper industry stands pre-eminent in its history for having surpassed all previous achievement in the establishment of new maximum records. Not only in production; in the tonnage and valuation of its exports and imports; in the volume of sales, were new high records made, but the highest price, 37c. per pound, ever obtained for copper was registered during February and March.

This achievement is the more remarkable because accomplished under unprecedented and perplexing conditions which prevailed during the year and which, in large measure, were due to the entrance of the United States into the great war and to the contingencies arising from time to time that were developed therefrom. The necessity for maintainance of heavy production in order to meet all requirements of the United States Government, in addition to supplying the needs of our European allies, was at once recognized. Last year's lamented surplus of refined copper, 128,000,000 pounds—accumulated at the close of 1916 when a new maximum total production of 2,959,000,000 pounds was made—proved to be a valuable asset, a safeguard and dependence for 1917; first, in view of the U-boat peril and later in the year when output was seriously menaced.

Labor disturbances at mines and smelters were long continued and recurring, breaking out again after being apparently settled, until the United States Government finally interfered and controlled them. Serious fires, accidental and otherwise, and almost insurmountable transportation difficulties, singly and combined, threatened the welfare of the industry. Many mines and smelters were compelled to cease operations for months at a time because of one or the other of these contingencies which were designedly promoted and developed by pro-Germanism in order to cripple production of material needed for the carrying on of the war.

Notwithstanding much anxiety expressed when curtailment of production was known to be severe, it is now believed that 1917 output will be in excess of the previous year. There have been and now are ample supplies of metal to meet not only all war needs of the United States and its Allies but there is sufficient metal also for domestic commercial purposes. Latest estimates place war requirements at 75 per cent. of total output which leaves quite enough for the diminished domestic consumption for other than war needs. Average monthly production has amounted to 200,000,000 pounds or a total of 2,400,000,000 pounds during the entire year. Adding to this, the copper derived from secondary material, total production, conservatively estimated, exceeded 3,000,000,000 pounds. Recoveries from secondary material have assumed a far greater importance than ever before because of economies made necessary in the use of copper during the war.

Record-breaking importations, a total of 252,000 tons, equivalent to 654,480,000 pounds, supplemented the domestic supply also and helped to bring about the satisfactory condition that exists in regard to production today. The decrease during late summer and early fall months was counterbalanced by the excessive output in first half of the year.

Exports of copper this year, 490,000 tons, equivalent to 1,097,600,000 pounds, increased nearly 50 per cent. as compared with 1916 and approximately 28 per cent. over the previous maximum in 1913. Sales made in 1917, according to trade estimates, were 2,382,000,000 pounds, based upon smelter output which leaves a surplus of 517,000,000 pounds of unrefined copper January 1, 1918, against 424,000,000 pounds January 1, 1917.

Uncertainty as to future conditions that developed as soon as the probability of Government regulation of distribution and price fixing became apparent, was a most potent influence in the copper market, expecially in relation to the volume of business transacted with domestic consumers and which dwindled into very small proportions after the largest producers in March offered to supply the Government over the next twelve months, with 45,500,000 pounds of copper at 16.6739c. per pound—cutting in half the market price, 32.00 to 34.00 prevailing at the time. When on September 21 the price of 23.50c. per pound was announced to have been agreed upon by producing interests and the Government to be operative over the succeeding four months, and applying to all sales of copper whether made to the Government or to private consuming interest, business came to a complete standstill pending adjustment to the new conditions which was not accomplished until early in December. The problem of supplying the small consuming interests, which had held up all jobbing business, was solved by allowing an advance of 5 per cent. over 23.50c. per pound on sales in less than carload lots, namely 24.67½c. per pound.

At the close of the year business was again proceeding smoothly and satisfactorily with transportation difficulties in a fair way to be solved under Government supervision, the railroads having been taken over by it.

TIN.

An extraordinary year was experienced in the tin industry in 1917. Never before was demand for the metal so great. United States consumption of tin is equal to much more than that of all other countries combined. Wartime requirements this year, for the manufacture of tin plate, used in making cans needed in supplying foods for the armies of the United States and its Allies, were enormously in excess of anything before experienced in the industry. Production in this country, in view of the difficulties attending importations—adverse British shipping regulations which permitted exploitation of American consumers and U-boat perils—was stimulated and increased by the construction of new smelters for the treatment of Bolivian and other ores, formerly considered too small in value of tin, for profitable smelting, became available because of the advance in prices to high levels that were maintained throughout the year. New production in this country is estimated to have increased to 1,000 tons per month.

Recovered metal was of unusual importance because of the scarcity of tin and owing to new methods developed, the 1917 recoveries will greatly exceed those of the previous year which surprised the trade. The United States Geological Survey estimated the 1916 tonnage as being equal to 24 per cent. of total importations of primary metal and valued it at $15,131,040. Official figures for this year, of course, are not yet available.

Because of these conditions, prices for all varieties of tin advanced to unheard of figures and business was greatly impeded, small consumers being the greatest sufferers, as was the case in copper. Early in December, 86c. was the nominal quotation in New York for spot Straits metal, a new high record exceeding by 21c. the previous maximum, 65c. established in 1914, and it was a total advance for the year of 43.50c. from the lowest price of the year, 42.50c. in January, which price was more than doubled.

Just before the close of the year, importations of tin, by agreement between the Governments of the United States and Great Britain, passed under control of the Iron & Steel Institute of the United States and business which had been at a complete standstill during the month was expected soon to be running smoothly again.

LEAD.

Lead in 1917, like copper and tin, established a new maximum

price, 12.25c. in June, and after ranging within a decline of 2 to 3c. during the summer, fell precipitately in October to 5.50c. per pound, the lowest for the year. Following this, there was a gradual advance to 6.50c. at the close of the year with a strong outlook for higher prices almost immediately. The decline from the highest to the lowest point was 6¾c. per pound and from the price at the beginning of the year the recession was 5¾c., the market closing at 6.50-6.75c. New York.

The official base price of the American Smelting and Refining Company fluctuated within a range of 5½c., from 7.50c. at the beginning of 1917 to the highest point—a new maximum, also—11c. in July, then in a number of changes down to the lowest point, 5.50c. in October after which there was a recovery to 6.25c. at the close of November with no further change at the end of the year.

Although price fixing by the Government was almost constantly anticipated and seemed impending from time to time, and had a strong bearing upon the market, Government purchases continued to be made satisfactorily upon the average basis of quotations in the Engineering & Mining Journal's St. Louis price.

Production in 1917 approximated 625,000 tons, an increase of nearly 50,000 tons over the previous maximum output, 579,000 tons in 1916. Importations of foreign lead according to the Department of Commerce statistics were 49,716 to October 31, inclusive, against 31,378 tons for the entire 12 months of 1916, while exports for the first eleven months were 59,016 tons against 100,885 tons in the previous year, showing a heavy falling off.

SPELTER.

Spelter in 1917, opened at 9.75c. per pound, St. Louis basis, advancing to the highest level—10.87½c.—of the year before the close of the same month. After ranging back to 9.00c. the advance to the highest level again occurred in March, but from that time on until the close of the year fluctuations had a downward trend to the lowest point in November, 7.50c., with a slight recovery to 7.65-7.75c. in the last few days of the year.

Production of spelter during the first quarter of 1917 averaged 65,000 tons per month, but owing to lack of demand from galvanizers and brass interests was reduced to about 60 per cent. of capacity during the last six months. Heavy Government buying was expected also, but not realized. Price fixing had not been accomplished either and the industry has united in an effort to find new uses of the metal in order to increase demand—especially in the manufacture of sheet zinc. At the close the outlook for increased buying by the Government was promising, several thousand tons being under negotiation.

ALUMINUM.

Whether the increased consumption of aluminum amounting to 21 per cent. in 1916 over the previous year was maintained in 1917, will not be known until United States Geological Survey statistics for the year are published, but judging from monthly reviews there has been a considerable falling off. Prices of the metal were at the maximum of the year, 64c. for No. 1 virgin 98-99 per cent. in January, after which the decline was gradual until July, following which it was more rapid, reaching the lowest —35c.—for the same variety in November with a recovery to 36c., remaining unchanged thereafter with trading in future aluminum at a standstill pending Government price fixing which was expected at any time.

ANTIMONY.

Active business and scarcity of antimony during the first four months of 1917, carried prices of the metal to 36c. per pound, the maximum for the year, in March and April. Importations were heavy in anticipation of war orders for shrapnel, which failed to develop, and prices receded owing to lack of demand, large supplies and anticipated Government regulation. The lowest price, 13.62½c. per pound was reached in November just before the War Trade Board announced that licenses for importations would in future be required and apply not only to ore, but to any chemical made therefrom. Prices advanced in December to 15.50c., but had declined at the close of the year to 14.50-14.75c. The total decline from January to end of December was 22c. per pound with the outlook for better business in 1918.

SILVER.

The active demand for silver coinage purposes, due to the war, carried prices of the metal to the highest level since 1881, 108½c. in September. After opening at 75⅜c. per ounce in January, fluctuations were in a range under 80c. until July and then the advance became sensational until the maximum was reached. A swift reaction immediately set in, the lowest point thereafter being 82½c. in October, after which the range was between 90⅛c. for the high and 84¼c. for the low; the closing figures were 86⅞c. Announcement of the result of the negotiations between Great Britain and the United States for regulation and price fixing were expected at any moment when the year closed.

QUICKSILVER.

Prices of quicksilver for the year fluctuated from $80 per flask at the beginning to $150 per flask in March, due to fear of U-boat peril cutting off supplies; after which the lowest price, $80, was again reached in June. Immediately following there was an advance to $115 by the end of July with a decline to $100 in November after which a rapid rise to $115 was registered, this remaining the price until a rise over night carried it to $130-$135 per flask on December 27.

United States Geological Survey statistics of 1916 production were published in August showing output of 29,932 flasks valued at $2,576,574, an increase in both quantity and advance in value over the previous year.

PLATINUM.

Owing to limited supplies of platinum, developments of discoveries in Alaska were undertaken with the assistance of the United States Government, during the summer of 1917. Prices advanced from $90 for pure at the beginning of the year to $105 in March which price remained unchanged thereafter throughout the year. For 10 per cent. iridium the price on January 1, 1917, was $105, which advanced to $110 in March, to $111 in July and to $113 in December.

The wartime need of this metal is so great that an appeal through the press was made to the general public to refrain from purchases of jewelry in which the metal is used.

OLD METALS.

Business in old metals was very active during the year, particularly so in the first half, and prices suffered less in anticipation of price fixing in the major market than had been expected. Uncertainty played its part later, and some price reductions were in evidence in an almost stagnant market at the close, when scraps were scarce.

WATERBURY AVERAGE

The average prices of Lake Copper and Brass Mill Spelter per pound as determined monthly at Waterbury, Conn.:

Lake Copper, 1917.—January, 32.25. February, 35.25. March, 35.50. April, 32.75. May, 32.00. June, 32.50. July, 30.875. August, 39.00. September, 27.25. October, 27.00. November, 23.50. December, 23.50. Average for 1917—30.97.

Brass Mill Spelter, 1917.—January, 13.05. February, 13.80. March, 13.45. April, 11.85. May, 11.05. June, 10.85. July, 10.55. August, 10.05. September, 9.80. October, 9.75. November, 9.65. December, 9.55. Average for 1917—11.116.

DECEMBER MOVEMENTS IN METALS

	Highest	Lowest	Average
COPPER:			
Lake	....	Market Nominal	23.50*
Electrolytic	....	Market Nominal	23.50*
Castings	....	Market Nominal	23.50*
TIN	86.00	81.00	84.143†
LEAD	7.00	6.25	6.537
SPELTER	7.97½	7.67½	7.77
ANTIMONY	15.50	14.62½	14.972
ALUMINUM	38.00	36.00	37.00
QUICKSILVER (per flask)	$135.00	$115.00	$117.624
SILVER (cts. per oz.)	.86⅞	.84¼	85.94

* Government price.

† Average of quotations from December 1 to 11, inclusive, market nominal thereafter.

Pig Iron and Metal Products of the United States

Calendar Years 1908-1916. (1917 Estimated)

(FROM THE UNITED STATES GEOLOGICAL SURVEY.)

PRODUCTS. METALLIC.	1908 Quantity.	1908 Value.	1909 Quantity	1909 Value.	1910 Quantity.	1910 Value.	Products.
Pig iron (spot value), long tons	15,936,018	$254,321,000	25,795,471	$419,175,000	26,674,123	$412,162,486	Pig iron
Silver, commercial value, troy ounces	52,440,800	28,050,600	54,721,500	28,455,200	57,137,900	30,854,500	Silver
Gold, coining value, troy ounces	4,574,340	94,560,000	4,821,701	99,673,400	4,657,018	96,269,100	Gold
Copper, value at New York City, pounds	942,570,721	124,419,335	1,092,951,624	142,083,711	1,080,159,509	137,180,257	Copper
Lead, value at New York City, short tons	311,666	26,179,944	352,839	30,344,154	375,402	33,035,376	Lead
Spelter, value at St. Louis, short tons	190,749	17,930,406	230,225	24,864,300	252,479	27,267,732	Spelter
Quicksilver, value at S. Francisco, flasks	19,752	872,446	21,075	957,859	20,601	958,153	Q'ksilver
Aluminum, pounds	11,152,000	2,434,600	34,210,000	6,575,000	(h) 47,734,000	8,955,700	Aluminum
Antimony, short tons	13,629	1,264,771	12,896	1,231,019	14,069	1,338,090	Antimony
Nickel, value at New York, pounds	.....	.....	19,284,172	10,027,769	25,359,544	13,186,963	Nickel
Tin, pounds	.....	.....	.....	17,499	.....	23,447	Tin
Platinum, value (crude) at New York City, troy ounces	750	14,250	638	15,950	773	25,277	Platinum
Total value of metallic products	.....	$550,047,352	.....	$763,420,861	.....	$761,257,081	

PRODUCTS. METALLIC.	1911 Quantity.	1911 Value.	1912 Quantity	1912 Value.	1913 Quantity.	1913 Value.	Products.
Pig iron (spot value), long tons	23,257,288	$327,334,624	30,180,969	$420,563,388	30,388,935	$458,342,345	Pig iron
Silver, commercial value, troy ounces	60,399,400	32,615,700	63,766,800	39,197,500	66,801,500	40,348,100	Silver
Gold, coining value, troy ounces	4,687,053	96,890,000	4,520,717	93,451,500	4,299,784	88,884,400	Gold
Copper, value at New York City, pounds	1,097,232,749	137,154,092	1,243,268,720	205,139,338	1,224,484,098	189,795,035	Copper
Lead, value at New York City, short tons	391,995	35,279,550	392,517	35,326,530	411,878	36,245,264	Lead
Spelter, value at St. Louis, short tons	271,621	30,964,794	323,907	44,699,166	337,252	37,772,224	Spelter
Quicksilver, value at S. Francisco, flasks	21,256	977,989	25,064	1,053,941	20,213	813,171	Q'ksilver
Aluminum, pounds	46,125,000	8,084,000	65,607,000	11,907,000	72,379,000	13,845,000	Aluminum
Antimony, short tons	14,078	1,380,556	13,552	1,311,348	16,665	1,591,854	Antim. L'd
Nickel, value at New York, pounds	890,000	127,000	.....	.....	481,565	79,393	Nickel
Tin, pounds	.....	56,635	.....	124,800	(k)	46,699	Tin
Platinum, value (crude) at New York City, troy ounces	940	40,890	1,005	45,778	1,034	46,530	Platinum
Total value of metallic products	.....	$670,905,830	.....	$852,720,289	.....	$880,745,984	

PRODUCTS. METALLIC.	1914 Quantity.	1914 Value.	1915 Quantity	1915 Value.	1916 Quantity.	1916 Value.	Products.
Pig iron (spot value), long tons	22,263,263	$298,777,429	30,384,486	$401,409,604	39,126,324	$663,478,118	Pig iron
Silver, commercial value, troy ounces	72,455,100	40,067,700	74,961,075	37,397,300	74,414,802	48,953,000	Silver
Gold, coining value, troy ounces	4,572,976	94,531,800	4,887,604	101,035,700	4,479,056	92,590,300	Gold
Copper, value at New York City, pounds	1,150,137,192	152,968,000	1,388,009,527	242,902,000	1,927,850,548	474,288,000	Copper
Lead, value at New York City, short tons	512,794	39,998,000	507,026	47,660,000	552,228	76,207,000	Lead
Spelter, value at St. Louis, short tons	343,418	35,029,000	458,135	113,617,000	563,451	151,005,000	Spelter
Quicksilver, value at S. Francisco, flasks	16,548	811,680	21,033	1,826,912	29,932	2,576,547	Q'ksilver
Aluminum, pounds	79,129,000	14,522,700	99,806,000	17,985,500	.....	33,900,000	Aluminum
Antimonial lead, short tons	16,667	1,572,167	23,224	3,665,736	24,038	4,463,582	Antim. L'd
Nickel, value at New York, pounds	845,334	313,000	1,120,556	448,222	.....	.....	Nickel (i)
Tin, pounds	208,000	66,560	204,000	78,846	278,000	*226,319	Tin
Platinum, value (crude) at New York City, troy ounces	6,324	280,885	8,665	478,688	28,008	2,301,762	Platinum
Total value of metallic products	.....	$678,938,921	.....	$968,505,508	.....	$1,550,630,820	

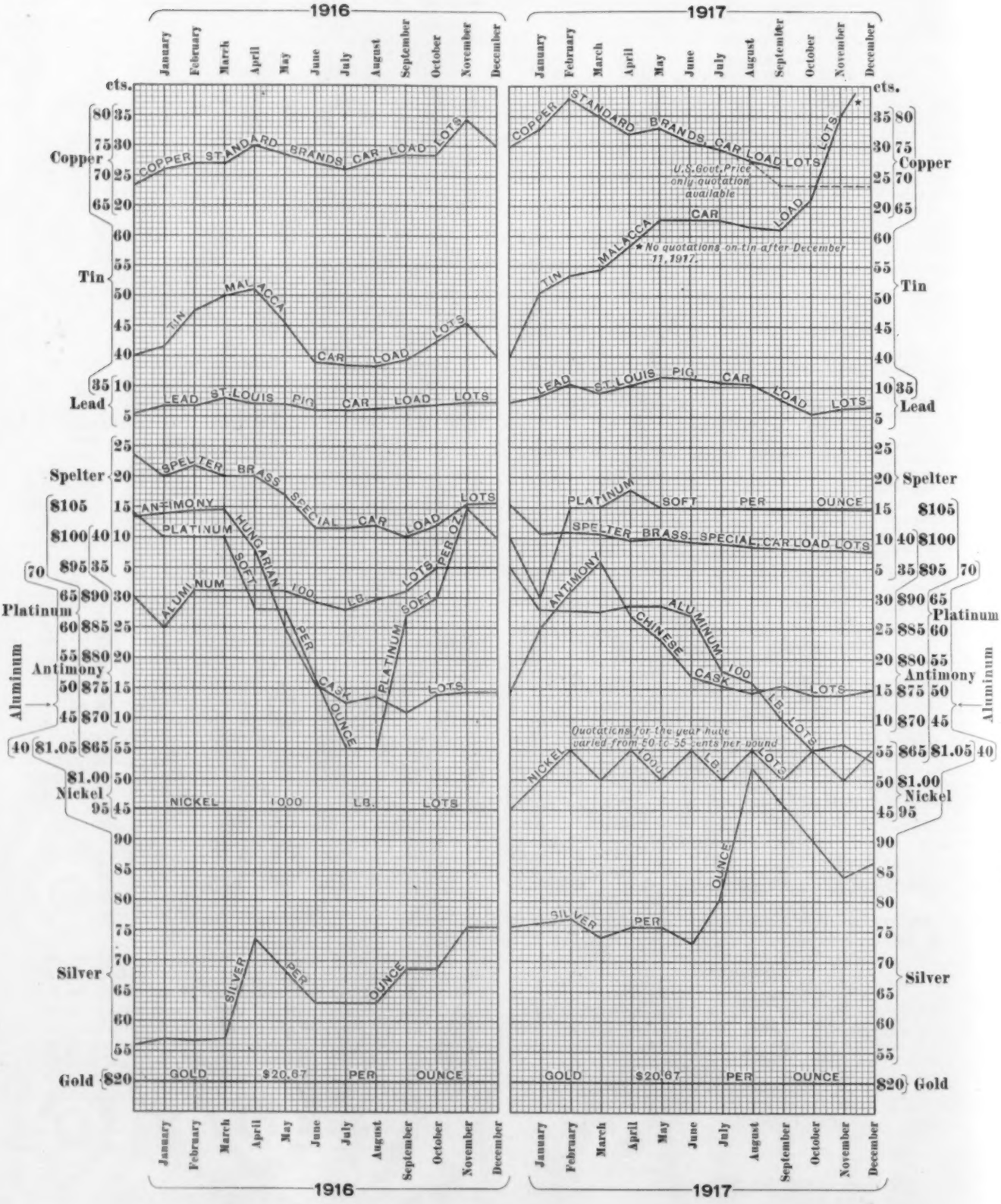
* Our own estimate.

1917 ESTIMATED.

PRODUCTS. METALLIC.	Quantity.	Value Total.	Value Per Unit.
Pig iron, long tons	38,750,000	$1,550,000,000	(i)
Copper, pounds	2,400,000,000	702,480,000	$0.273
Gold, ounces, fine	4,085,500	84,456,600	20.67
Antimonial lead, short tons	19,562	3,129,920	(i)
Lead, short tons	625,000	114,500,000	(i)
Spelter, short tons	576,000	104,947,600	(i)
Quicksilver, flasks	28,000	2,968,000	(i)
Silver, ounces, fine	74,244,500	60,442,447	(i)
Nickel, pounds	.....	.....	(i)

(h) Consumption 1910-1911-1912.
(i) Figures not available.
(k) Small production from Alaska, South Carolina and South Dakota.

CHART OF METAL PRICES FOR 1916-1917



Metal Prices, January 7, 1918

NEW METALS.

	Price per lb.
Copper—Duty Free. Plate, Bar, Ingot and Old Copper. Manufactured 5 per centum.	
Electrolytic, carload lots, nom.. / Lake, carload lots, nominal....	Government price 23½
Casting, carload lots, nominal	23½
Tin—Duty Free.	
Straits of Malacca, carload lots	86.00
Lead—Duty Pig, Bars and Old 25%; pipe and sheets.	
20%. Pig lead, carload lots	6.75
Spelter—Duty 15%.	
Brass Special	8.00
Prime Western, carload lots, nominal	7.825
Aluminum—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½ per lb.	
Small lots, f. o. b. factory	45.00
100-lb. f. o. b. factory	41.00
Ton lots, f. o. b. factory	37.00
Antimony—Duty 10%.	
Cookson's, Hallet's or American	Nominal
Chinese, Japanese, Wah Chang WCC, brand spot..	14.50
Nickel—Duty Ingot, 10%. Sheet, strip and wire 20% ad valorem.	
Shot or Ingots	50c.
Electrolytic—5 cents per pound extra.	
Manganese Metal	Nominal
Magnesium Metal—Duty 25% ad valorem (100 lb. lots)	$2.25
Bismuth—Duty free	$3.00
Cadmium—Duty free	nominal $1.50
Chromium Metal—Duty free	.75
Cobalt—97% pure	$2.70
Quicksilver—Duty, 10% per flask of 75 pounds	$135.00
Platinum—Duty free, per ounce	$105.00
Silver—Government assay—Duty free, per ounce	.89⅜
Gold—Duty free, per ounce	$20.67

INGOT METALS.

	Price per lb.
Silicon Copper, 10%	according to quantity 49 to52
Silicon Copper, 20%	" " 55 to60
Silicon Copper, 30% guaranteed. / Phosphor Copper, guaranteed 15%	Not on market.
Phosphor Copper, guaranteed 10%	according to quantity 61 to68
Manganese Copper, 30%, 2% Iron	" " 59 to65
Phosphor Tin, guaranteed 5%	" " 96 to98
Phosphor Tin, no guarantee	" " 95 to97
Brass Ingot, Yellow	" " 17 to19
Brass Ingot, Red	" " 25 to26
Bronze Ingot	" " 24 to25½
Parsons Manganese Bronze Ingots	" " 33½to35
Manganese Bronze Castings	" " 40 to52
Manganese Bronze Ingots	" " 26 to30
Phosphor Bronze	" " 24 to30
Casting Aluminum Alloys	" " 37 to38

OLD METALS.

Dealers' Buying Prices.		Dealers' Selling Prices.
22.00	Heavy Cut Copper	23.50
22.00	Copper Wire	23.50
19.00	Light Copper	21.00
21.00	Heavy Mach. Comp.	23.50
14.00	Heavy Brass	16.00
10.50	Light Brass	12.50
13.00	No. 1 Yellow Brass Turning	15.00
18.00	No. 1 Comp. Turnings	21.00
5.50	Heavy Lead	6.00
6.00 to 6.25	Zinc Scrap	6.25 to 6.75
10.00 to 13.00	Scrap Aluminum Turnings	11.00 to 14.00
18.00 to 20.00	Scrap Aluminum, cast alloyed	20.00 to 22.00
26.00 to 28.00	Scrap Aluminum, sheet (new)	28.00 to 30.00
39.00 to 40.00	No. 1 Pewter	43.00 to 47.00
30.00 to 32.00	Old Nickel	34.00 to 36.00
22.00 to 23.00	Old Nickel anodes	25.00 to 26.00

PRICES OF SHEET COPPER.

Mill shipments (hot rolled) ..... 31½c. base net
From stock ..... 33c. base net

Width.	LENGTH.	64 oz. and over.	32 oz. to 64 oz.	24 oz. up to 32 oz.	16 oz. up to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
		Extras in Cents per Pound for Sizes and Weights Other than Base.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 inches.	"	"	½	1	2	3	5	7	
	Longer than 120 ins.	"	"	1	1½					
Wider than 30 ins., but not wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4			
	Longer than 120 inches.	"	1	2	3					
Wider than 36 ins., but not wider than 48 inches.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9	
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9			
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins., but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10			
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins., but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins., but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches	2	4	7						
	Not longer than 120 inches	3	5	9						
Wider than 108 ins., but not wider than 120 ins.	Not longer than 120 inches.	4	6							

The longest dimension in any sheet shall be considered as its length.

CIRCLES, 8 IN. DIAMETER AND LARGER, SEGMENTS AND PATTERN SHEETS, advance per pound over prices of Sheet Copper required to cut them from ..... 8c.

CIRCLES LESS THAN 8 IN. DIAMETER, advance per pound over prices of Sheet Copper required to cut them from ..... 8c.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot and heavier, advance per pound over foregoing prices ..... 1c.

COLD OR HARD ROLLED COPPER, lighter than 14 oz. per square foot, advance per pound over foregoing prices ..... 2c.

COLD ROLLED ANNEALED COPPER, the same price as Cold Rolled Copper.

ALL POLISHED COPPER, 20 in. wide and under, advance per square foot over the price of Cold Rolled Copper ..... 1c.

ALL POLISHED COPPER, over 20 in. wide, advance per square foot over the price of Cold Rolled Copper ..... 2c.

For Polishing both sides, double the above price.

The Polishing extra for Circles and Segments to be charged on the full size of the sheet from which they are cut.

COLD ROLLED COPPER, prepared suitable for polishing, same prices and extras as Polished Copper.

ALL PLANISHED COPPER, advance per square foot over the prices for Polished Copper ..... 1c.

Metal Prices, January 7, 1918

PRICES ON BRASS MATERIAL—MILL SHIPMENTS

In effect January 3, 1918.

To customers who buy 5,000 lbs. or more per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.28	$0.31	$0.33
Wire	.28	.32	.34
Rod	.26	.32	.34
Brazed tubing	.36	—	.41
Open seam tubing	.36	—	.41
Angles and channels	.36	—	.41

To customers who buy less than 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.29½	$0.32½	$0.34½
Wire	.29½	.33½	.35½
Rod	.27½	.33½	.35½
Brazed tubing	.37½	—	.42½
Open seam tubing	.39½	—	.42½
Angles and channels	.37½	—	.42½

[Note.—Net extras for quality for both sections of above metal prices are not quoted due to the fluctuations in the price of zinc.—Ed.]

BARE COPPER WIRE—CARLOAD LOTS.

26½c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	37c.	per lb. base
100 lbs. to 300 lbs. in one order	38c.	" " "
Less than 100 lbs. in one order	39½c.	" " "

PRICES FOR SEAMLESS BRASS AND COPPER TUBING.

From 1¼ to 3½ O. D. Nos. 4 to 13 Stubs' Gauge. — per lb.
Seamless Copper Tubing. — per lb.

For other sizes see Manufacturers' List.

Due to fluctuations of the metal market we are unable to quote these prices.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe sizes with price per pound.

⅛ ¼ ⅜ ½ ¾ 1 1¼ 1½ 2 2½ 3 3½ 4 4½ 5

Due to fluctuations of the metal market we are unable to quote these prices.

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

Due to fluctuations of the metal market we are unable to quote these prices.

PRICES FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod	33½c. net base
Munts or Yellow Metal Sheathing (14" x 48")	30c. " "
Munts or Yellow Metal Rectangular sheets other than Sheathing	33c. " "
Munts or Yellow Metal Rod	31c. " "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 65c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

PRICES OF NICKEL ANODES.

85 to 87% purity	52½c. per lb.
90 to 92% "	55c. " "
95 to 97% "	57½c. " "

PRICES OF SHEET ZINC.

Duty, sheet, 15%.

	Cents per lb.
Carload lots, standard sizes and gauges, at mill	19 cent basis, less 8%
Casks, jobbers' prices	20c.
Open casks, jobbers' prices	20.5c.

BASE PRICE GRADE "B" GERMAN SILVER SHEET METAL.

Quality.	Net per lb.	Quality.	Net per lb.
5%	42½c.	16%	47c.
8%	43½c.	18%	47½c.
10%	43¾c.	20%	49¼c.
12%	45½c.	25%	57c.
15%	49c.	30%	62½c.

GERMAN SILVER WIRE.

Quality.	Net per lb.	Quality.	Net per lb.
5%	44c.	15%	52c.
8%	46c.	16%	52½c.
10%	48c.	18%	54½c.
12%	50c.	30%	70c.

The above Base Prices are subject to additions for extras as per list printed in Brass Manufacturers' Price List and from such extras 50% discount will be allowed. The above base prices and discounts are named only to wholesale buyers who purchase in good quantities. Prices on small lots are considerably higher.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Sheet Block Tin—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more. 5c. over Pig Tin. 50 to 100 lbs. 7c. over, 25 to 50 lbs. 8c. over, less than 25 lbs. 10c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 2c. over Pig Tin. 50 to 100 lbs. 4c. over, 25 to 50 lbs. 5c. over, less than 25 lbs. 8c. over.

Above prices f. o. b. mill.

Prices on wider or thinner metal on request.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from — below to — above the price of bullion.

Rolled silver anodes .999 fine are quoted at ——— above the price of bullion. Manufacturers state that as silver is selling at a premium at the present time they are unable to give any quotation.

STOCK MARKET QUOTATIONS: METAL COMPANIES.

New York, January 3, 1918

	Par	Bid	Asked
Aluminum Company of America	$100	550	600
American Brass	100	223	228
American Hardware Corp.	100	120	127
Bristol Brass	25	37	45
Canadian Car & Foundry Com.	100	18½	20
Canadian Car & Foundry Pfd.	100	48	50
Eagle Lock	25	68	72
International Silver Com.	100	40	60
International Silver Pfd.	100	80	85
New Jersey Zinc	100	232	236
Rome Brass & Copper	100	285	315
Scovill Manufacturing	100	420	450
Standard Screw Common	100	215	230
Standard Screw "A" Pfd.	100	105	none offered
Yale & Towne Mfg. Co.	100	185	200

Corrected by J. K. Rice, Jr., & Co., 36 Wall St., New York.

SOME INFORMATION FOR METAL BUYERS

In meeting all requirements of the trade, so many different alloys, tempers and anneals must necessarily be used, that it is not practicable to outline in a price list, the kind or quality of material best suited for a particular purpose.

Therefore, in addition to information regarding thickness, width, length and temper; which should invariably appear on each order; it is essential that initial orders should state plainly the purpose for which the material is intended and so far as possible how it is to be worked. A sample or blue print will aid in determining the proper materials required.

The adoption of the Micrometer Caliper to determine the thickness of metal or the size of wire in decimal parts of an inch, and the abolition of all gauge numbers when ordering, is strongly recommended. This will prevent confusion, expense and loss of time.

Metal Prices, January 7, 1918

PRICES CURRENT FOR VARIOUS FORMS OF ALUMINUM

Sheet Aluminum, outside market contract base price, 55c. per pound.

Sheet Aluminum, outside market stock, and mill prompt shipment, 60c. per pound.

98-99% Remelt Aluminum Ingots, outside market, 36c. per pound.

No. 1 Virgin Aluminum Ingots, outside market, 38c. per pound.

Aluminum Rods and Wire, outside market, prompt shipment, 60 to 65c. per pound.

EXTRAS FOR FLAT SHEETS ROLLING.

	To 18 Ga.	18-20	21-24	25-26	27	28	29	30	32	34
3 to 26″ wide—										
24 to 96″ long	Base	Base	.01	.02	.03	.04	.05	.06	.07	.08
97 to 120″ "	Base	Base	.02	.03	.04	.05	.07	.08	..	..
121 to 156″ "	Base	.01	.03	.05	.08	.10	..	..	..	..
26 to 47″ wide—										
24 to 96″ long	Base	Base	.03	.04	.05	.06	.08	.10	..	..
97 to 120″ "	Base	Base	.04	.06	.07	.08	..	..	..	..
121 to 156″ "	Base	.01	.05	..	..	..	..	..	..	..
48 to 60″ wide—										
24 to 96″ long	Base	Base	.06	.10	..	..	..	..	..	..
96 to 120″ "	Base	Base	.08	..	..	..	..	..	..	..
121 to 156″ "	.01	.01	.10	..	..	..	..	..	..	..
60 to 68″ wide—										
24 to 96″ long	Base	Base	.05	..	..	..	..	..	..	..
96 to 120″ "	.01	.01	.08	..	..	..	..	..	..	..
121 to 156″ "	.02	.02	..	..	..	..	..	..	..	..

EXTRAS FOR STRIP ROLLED SHEETS.

	3-13	14	15	16	18	20	21	22	24
12 to 15 Ga., Inc.	Base	Base	Base	Base	Base	.01	.02	.02	.03
16-17	Base	Base	Base	Base	Base	.01	.02	.02	.04
18-20	Base	Base	Base	Base	.01	.02	.03	.04	.05
21-22	Base	Base	Base	.01	.02	.02	.04	.05	.06
23-24	Base	Base	.01	.02	.02	.03	.05	.06	.08
25	Base	Base	.01	.02	.03	.04	..	..	..
26	.01	.01	.02	.03	.04	.05	..	..	..
27	.01	.01	.02	.03	.05	.06	..	..	..
28	.02	.02	.03	.05	.07	..	..	..	..
29	.02	.02	.03	.05	.08	..	..	..	..
30	.03	.03	.04	.06	..	..	..	..	..
32	.04	.04	.06	..	..	..	..	..	..
34	.05	.06	..	..	..	..	..	..	..

EXTRAS FOR SHEARING.

	12 to 20	21 to 26	27 to 30	31 to 34
Less than 3″ to 1½″ wide	.01	.02	.03	.04
Less than 1½″ to ¾″ wide	.02	.03	.04	.06
3 to 30″ wide—				
12 to 24″ long	.02	.03	.04	.07
6 to 12″ long	.04	.05	.06	.08
3 to 6″ long	.06	.08	.09	.10

Circles 3c. per pound extra.

SOME INFORMATION FOR ALUMINUM USERS

FABRICATED ALUMINUM.

Aluminum and its alloys can be obtained in various forms convenient for the trade. For the foundry trade the casting alloys are made in bars convenient for re-melting. Aluminum and its alloys are rolled into a sheet and drawn and extruded into shapes as are the other useful metals. In the following is set forth the various forms in which aluminum can be obtained for industrial purposes.

ALUMINUM INGOTS FOR RE-MELTING.

These ingots are in the form of "waffle" ingots. They are square plaques, 3 inches on a side and of about ¾ of an inch in thickness and weigh about ½ pound each; they are connected by thin webs, which make it possible to break the ingot into parts suitable in size for the re-melting crucible.

Ingots 14 inches long and 1¼ inches wide can also be obtained for re-melting. These ingots are made with different numbers of notches. Thus, ingots of the above length and width can be furnished to be broken up in any number of pieces from 2 to 10. For convenience sake the manufacturers use for each of the several grades of metal a certain one of the above forms, although, if so desired, metal of the different grades will be furnished in any of these ingot forms.

SHEET ALUMINUM.

Aluminum is very ductile, and has frequently been subjected to the most severe tests with satisfactory results. It can be rolled into sheets of .0007 inch thickness and then can be beaten into leaf, equal in quality to the best leaf manufactured in the world. Aluminum can also be drawn into tubes or wire and spun or stamped into different shapes.

Chemical Prices, January 7, 1918

PRICES OF SOME METAL INDUSTRY CHEMICALS AND MATERIALS

Acid—		
Acetic, 30%	lb.	.15
Acetic, glacial, 99½%, carboys	lb.	.55
Boric (Boracic) Crystals	lb.	.25
Hydrochloric (Muriatic) Com., 18 deg	lb.	.06
Hydrochloric, C. P., 22 deg	lb.	*.01⅝
Hydrofluoric, 30%	lb.	.40
Nitric, 36 deg	lb.	.09¼
Nitric, 42 deg	lb.	.11⅛
Sulphuric, 66 deg	lb.	.08
Alcohol, wood, 95%	gal.	—
Denatured	gal.	1.05
Alum—		
Lump	lb.	.09
Powdered	lb.	.15
Aluminum sulphate, iron free	lb.	.15
Aluminum chloride solution	lb.	.16
Ammonia aqua, 26 deg., carboys	lb.	—
Ammonium carbonate	lb.	.20
Chloride	lb.	.25
Hydrosulphuret	lb.	.60
Sulphate, tech.	lb.	.10
Sulphocyanide	lb.	—
Amyl acetate	gal.	—
Arsenic, white	lb.	—
Argols, white, see Cream of Tartar	lb.	.75
Asphaltum	lb.	.35
Benzol, pure	gal.	1.00
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate)	lb.	.15
Calcium Carbonate (Precipitated Chalk)	lb.	.15
Carbon Bisulphide	lb.	.20
Chrome Green	lb.	—
Cobalt Chloride	lb.	—
Copper—		
Acetate (Verdigris)	lb.	—
Carbonate	lb.	.40
Cyanide	lb.	1.00
Sulphate	lb.	.17
Copperas (Iron Sulphate)	lb.	.06
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.75
Crocus	lb.	.10
Dextrin	lb.	.20
Emery Flour	lb.	.10
Flint, powdered	ton	—
Fluor-spar (Calcic fluoride)	ton	—
Fusel Oil	gal.	—
Gold Chloride	oz.	12.00
Gum—		
Sandarac	lb.	—
Shellac	lb.	—
Iron Sulphate, see Copperas	lb.	.06
Lead Acetate (Sugar of Lead)	lb.	.25
Yellow Oxide (Litharge)	lb.	.20
Liver of Sulphur, see Potassium Sulphide	lb.	.15
Mercury Bichloride (Corrosive Sublimate)	lb.	—
Nickel—		
Carbonate, dry	lb.	.80
Chloride	lb.	.70
Salts, single bbl.	lb.	.14
Salts, double bbl.	lb.	.11
Niter (Saltpeter), see Potassium Nitrate.		
Paraffin	lb.	.20
Phosphorus—Duty free, according to quality		nominal
Potash, Caustic (Potassium Hydrate)	lb.	—
Lump	lb.	—
Potassium Bichromate	lb.	—
Carbonate, 34-36%	lb.	—
Cyanide, 98-99½%	lb.	—
Sulphocyanide	lb.	—
Pumice, ground	lb.	—
Quartz, powdered	ton	—
Official	oz.	.73⅝
Rosin	lb.	.08
Rouge, nickel	lb.	.25
Silver and gold	lb.	.40
Sal Ammoniac (Ammonium Chloride)	lb.	.25
Sal Soda	lb.	.05
Silver Chloride, dry	oz.	—
Cyanide	oz.	—
Nitrate	oz.	59.36
Soda Ash, 58%	lb.	.08
Sodium—		
Biborate, see Borax	lb.	.15
Bisulphite	lb.	.15
Cyanide	lb.	.37
Hydrate (Caustic Soda)	lb.	.15
Hyposulphite	lb.	.08
Nitrate, tech.	lb.	.10
Phosphate	lb.	.14
Silicate (Water Glass)	lb.	.05
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.25
Sulphur (Brimstone)	lb.	.10
Tin, Chloride	lb.	.75
Tripoli Composition	lb.	.06
Verdigris, see Copper Acetate.		
Water Glass, see Sodium Silicate.		
Wax—		
Bees, white ref. bleached	lb.	—
Yellow	lb.	*.60
Whiting	lb.	.05
Zinc, Carbonate	lb.	.30
Chloride	lb.	.35
Cyanide	lb.	*1.00
Sulphate	lb.	.12

PRICES FOR COTTON BUFFS.

Open buffs, per 100 sections (nominal).

12 inch,	20 ply,	64/68,	cloth	base	$47.00
14 "	20 "	64/68,	"	"	62.50
12 "	20 "	84/92,	"	"	55.30
14 "	20 "	84/92,	"	"	71.70

Sewed buffs per pound.

Bleached and unbleached	base	44c.
Colored	"	41c.

PRICES FOR FELT WHEELS.

White Spanish— Diameter	Thickness	Price.
6 to 10 inch	1 to 3 inch	$2.60 per lb.
10 to 16 "	1 to 3 "	2.50 " "
6 to 16 "	Under 1 "	2.75 " "
Over 16 "	Over 3 "	2.60 " "

Mexican Wheels— Diameter	Thickness	Price.
6 to 10 inch	1 to 3 inch	$2.50 per lb.
10 to 16 "	1 to 3 "	2.40 " "
6 to 16 "	Under 1 "	2.65 " "
Over 16 "	Over 3 "	2.50 " "

*Wholesale price.